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THE AGRICULTURAL GAZETTE OF CANADA

Vol. XI March-April, 1924 No. 2

LEADING TOPICS

Dairy Research
Canadian Meat Industry
Outlook for Dairying
European Corn Borer
Progress of Field Husbandry in Saskatchewan
British Columbia Seed Potatoes
Quebec Honey
Grain Cleaning Investigations
Tree Planting on the Prairie Farm
Agricultural Education in Manitoba
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STORAGE

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

The Agricultural Gazette of Canada is published bi-monthly, in English and in French, by the Dominion Department of Agriculture, Ottawa.

The aim of The Agricultural Gazette is to provide a source of information as to the policies and activities of the Dominion Department of Agriculture and of the Provincial Departments of Agriculture and of Education, so far as the work of the latter relates to Agricultural Education. Besides being a publicity medium, it constitutes a comprehensive record of the progress and development of departmental effort on behalf of Agriculture in Canada.

The Agricultural Gazette is not intended for general distribution. It is sent free to official workers and teachers, including school teachers who have agricultural teaching qualifications; to members of parliament; to libraries; to the Press; to Immigration and Trade agents, and, as an exchange, to agricultural institutions in other parts of the Empire and in foreign countries.

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DEPARTMENT OF AGRICULTURE
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OF CANADA

ANNOUNCEMENT

According to instructions given by the Minister of Agriculture, *The Agricultural Gazette of Canada* will cease publication with the present issue, namely, that of March-April, 1924.

Subscriptions for the unexpired portion of 1924 will be refunded.

J. B. SPENCER,
Director of Publicity.

Publications Branch,
Department of Agriculture,
Ottawa, Canada.

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The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

ssued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

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DAIRY RESEARCH

THE establishment of a Research Division in the Dairy and Cold Storage Branch of the Dominion Department of Agriculture, marks the first attempt made in Canada to conduct systematic investigations looking to the solution of problems of bacterial or fungous origin in connection with the dairy industry.

While it is true that, during the last few years, some effort has been made through the Honorary Advisory Council for Scientific and Industrial Research to foster research in dairying, and while, in various Canadian Agricultural Colleges and Dairy Schools, some attention has been and is being given to test or experimental work, very little in the sense of pure research work is being undertaken. This omission is due so far as the Agricultural Colleges are concerned to onerous teaching schedules and to the lack of research professors and assistants on the college staffs.

Research is recognized as essential to progress and success in all great industries. Some of these support research laboratories employing hundreds of men. Many of these men, of course, work directly on practical problems; others work merely to extend human knowledge without any regard to its immediate application, but with the conviction that the facts ascertained will find their application, just as they have always done.

It is scarcely necessary to defend dairy research. Progress in dairying has always been impossible without something of the nature of research. In the United States, we find such organizations as the Department of Agriculture, Experiment Stations and Agricultural Colleges employing large staffs of research professors and assistants, with excellent laboratories and equipment, in an endeavour to advance the industry both scientifically and commercially. In Canada this is not the case. Owing to a peculiar condition, we have not been compelled to take up dairy research, but have accepted and used the findings and facts arrived at or ascertained in other countries. Canada, however, has been exceedingly well served in the way of practical instruction through the dairy schools and field workers, but the time has arrived when substantial improvement can come only with fuller scientific knowledge and its application to the industry.

Everyone engaged in dairying who has been suddenly confronted with a practical problem in connection, say, with the cause of mouldy butter, or the neutralization of cream for buttermaking, will realize how essential it is that there should be a reserve of fundamental knowledge which the maker can call to his assistance. The dairyman without a research department to fall back upon is not unlike a factory without a master mechanic.

Another justification for dairy research, if one be needed, is found in the fact that the dairy industry is

faced with a critical home market and with keen competition in the export market. The slogan of the Canadian dairyman of to-day is Quality, and this in itself should be an incentive to concentrate effort in the direction of research. Foreign researches are not in all cases applicable to Canadian conditions, and to offset this, the Dominion Department of Agriculture has made a beginning by the appointment of Dr. E. G. Hood as chief of the new Division of Dairy Research in the Dairy and Cold Storage Branch, where he will be at liberty to investigate the origin of many special and local problems as they arise, problems that can be dealt with only by the trained scientific investigator.

THE MEAT INDUSTRY OF CANADA

By P. E Light, Markets Intelligence Service, Live Stock Branch.

THE production of live stock for meat is an essential part of Canadian agriculture, and represents one of the country's chief sources of revenue. In Canada, more so than in many other countries, the permanent financial well-being of the people is closely associated with the condition of the live stock industry on farm and range. Happily, soil, climate and the character of the people lend themselves admirably to the successful breeding and feeding of cattle, sheep and swine. The soils of Canada are extremely responsive to tillage, and produce coarse grains and fodder crops in an abundance and of a quality conducive to liberal and advantageous feeding. In addition, the natural grasses on range and pastures are luxuriant and strong, and the sown grasses and clovers strikingly productive. An outstanding factor in the live stock situation is the healthfulness of the climate, which promotes thriftiness, ruggedness and comparative freedom from disease. Under the influence of the vigorous winter climate, and the long bright summer days, all classes of stock are perpetuated under almost ideal conditions.

The make-up of the industry is distinctly British. It reflects a conservative adherence to certain well established breeds, and particularly as it concerns the production of beef, has behind it a long period of importations from Great Britain—a country famous as the home of the world's outstanding live stock families—dating from the beginning of the nineteenth century.

But the history of live stock on Canadian soil goes back to a much earlier period for we find that in 1667, at the beginning of the French régime, when the human population numbered less than 2,000 souls, the live stock holdings were estimated at 3,107 "horned cattle," 88 sheep and 1,000 swine. In the year 1699, the King of France, in despatches of instruction to the Governor of Quebec, then known as New France, demanded the stimulation of cattle rearing as a means whereby the colony might eventually supply beef for the needs of the troops in France.

Fifty years ago, the human population of the Dominion numbered but 3,689,257 people; to-day the population is about 8,769,000. Comparing the increase in human population with that in live stock, one will appreciate the rapidity at which Canada has developed her meat output. In 1871 there were approximately 2,624,000 cattle, 3,000,000 sheep and 1,334,000 hogs—a total of about 6,950,000 animals; and in 1923 there were 9,246,000 cattle, 2,750,000 sheep,

and 4,405,000 hogs—a total of about 16,401,000 animals, and an increase of well over 100 per cent.

The holdings of farm live stock in 1923, by provinces, is given by the Dominion Bureau of Statistics as follows:—

—	Cattle No.	Sheep No.	Swine No.
Prince Edward Island	130,578	83,933	42,011
Nova Scotia	271,048	258,537	44,034
New Brunswick	212,901	157,808	66,182
Quebec	1,781,751	822,997	797,726
Ontario	2,838,087	907,673	1,734,734
Manitoba	691,711	93,162	291,236
Saskatchewan	1,535,087	137,240	679,867
Alberta	1,520,924	239,174	706,681
British Columbia	264,144	53,336	42,845
Total	9,246,231	2,753,860	4,405,316

Value of Live Stock Holdings

The five year average value of the commercial live stock holdings in the Dominion from 1919 to 1923 inclusive, is approximately $659,000,000, of which amount $540,000,000 is credited to cattle, $37,000,000 to sheep and $82,000,000 to swine. During the last stages of the War, when prices were at the peak, the value of Canadian live stock was approximately $1,000,000,000.

Live Stock Exports

About the year 1880, an import demand for commercial live stock developed in Great Britain. The business was facilitated by the ocean steamship, which then became available for carrying cattle overseas. A strong business resulted in cattle and sheep with British feeders and with the British trade.

Although in the year 1871, not one head of stock had been shipped to Great Britain, in 1881, ten years later, 49,909 cattle and 80,222 sheep were brought in by British importers. In 1891, exports overseas amounted to 107,689 cattle and 299,347 sheep. In 1901, over 119,000 cattle were sold to Great Britain, and in 1911 approximately 114,000. The disrupting of trade, as a result of the World War, caused a diversion of live stock exports from Great Britain to the United States of America. From 1914 to 1922, the average of the annual exports of live cattle to the United States amounted to approximately 200,000 head. During the twelve months ended March 31, 1923, approximately 35,500 cattle were exported to Great Britain, and 217,480 to the United States.

The Modern Phase

The modern phase of the live stock industry supplies liberal material for a story of a notable development. Up to the beginning of the present century, the annual surplus of live stock was killed on the farm, or by local butchers, or exported direct from prairie and farm. Within the past twenty years public stock yards have susperseded both the local market and the individual exporter; and an organized packing industry has largely supplanted the slaughter of live stock at the place of origin. The gradual passing of the grazing range and the introduction of centralized marketing and meat packing followed closely on the heels of railroad development and extension.

The steadily growing industrial centres of the Dominion provided an expanding outlet for all sorts of food commodities, not the least among which were the products from the live stock industry. Centralized marketing and slaughtering developed as a matter of course. In the older provinces, such as Ontario and Quebec, the massing of population came about with considerable rapidity. Twenty years ago, Toronto on Lake Ontario had a population of about 200,000, it is now a city of 522,000 people. Montreal, on the St. Lawrence river, boasts a population of 712,000; Winnipeg, at the junction of the Assiniboine and Red Rivers, once Fort Garry, to-day is one

of the most modern cities of the New World, with a population of 191,908; Calgary's population is 63,305, and Edmonton's, 58,821. Vancouver, the leading port on the Pacific coast, comprises a population of 139,364. Other leading city populations are Hamilton, 114,151, Ottawa, 107,843, London, 60,959, and Quebec city, 95,193.

But perhaps the greatest impelling force behind the development of organized marketing and packing has been the exploitation of the British bacon market, requiring as it did the growing of a particular type of hog, bred, fed and cured with the requirements of the British market in view. How successful this project has been may be judged from bacon export statistics.

Commercial Herds

Cattle.—The commercial cattle herds have their modern foundation in well recognized Shorthorn, Aberdeen-Angus and Hereford families. This applies to the large herds on the western ranges, as well as to the smaller holdings in the mixed farming areas of the western provinces and Ontario and Quebec. These herds are maintained from year to year by introductions from the many pure bred herds to be found throughout the Dominion, and whose breed character and quality are maintained through frequent purchases from the best herds in the British Isles.

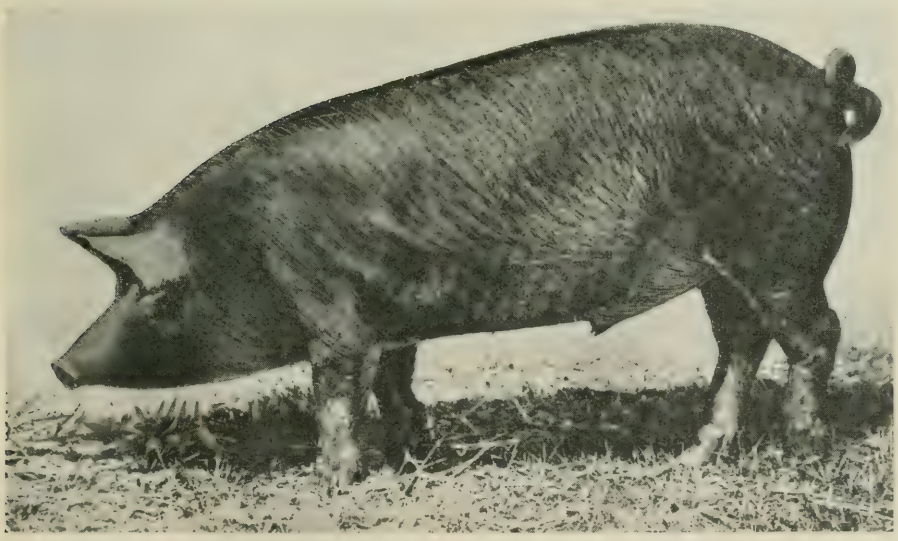
The removal in 1923 of the British embargo against Canadian store cattle provided the British trade with a first-hand opportunity to judge the quality of Canadian cattle, for in the last analysis, the steer is judged, not by his family connections, but on the basis of his carcase quality. From the verdict of the British feeder trade and consumer, it may be fairly inferred that no cattle respond better to feed and care than do those reared on the farms of the Dominion. This fact reflects credit on those breeders in Great Britain whose animals are the ancestors of the Canadian store and fat animal, and from whom Canadian importers are continually purchasing new blood for distribution within the Dominion.

The Canadian Departments of Agriculture, Federal and Provincial, are constantly seeking to promote a policy whereby the majority of Canadian cattle will be finished and marketed at around two years, rather than the production of heavy animals maintained for four or five years in stable and on grass, thereby increasing the supply of stock of the type and quality indicated by the needs of the British importer.

Sheep.—The sheep industry as a source of wool and meat supply is being given special attention at the present time. During the past year some very liberal importations were made of rams from noted British flocks, in order to stimulate breeding activity and augment the depleted supply of native bred sires arising from an active demand for improved blood. Canadian lamb sells readily and almost invariably commands a high price in foreign markets. Co-operative selling both of animal and wool, strict attention to docking, dipping and castrating, under Government arrangement, are factors that tend to promote the production of sheep on a gradually expanding scale. The sheep industry is recognized already as a most important adjunct to farming operations, and in view of the comparatively large acreage of grazing lands and the many exclusive areas that are useful almost solely for sheep production, the possibilities for the extension of the industry are considerable.

Bacon Hogs.—The production of hogs occupies an important place in Canadian agriculture. In fact, the growing of pigs for Wiltshire bacon

Yorkshire Hogs of the type, size and weight aimed at for Canada's Bacon Trade.



Tamworth Hog of the type for making Select Export Bacon.

production is one of the most valuable single enterprises in the farming industry. No other line of production is receiving more definite direction, nor is there any other line of breeding and feeding where more strict attention is being given to the exacting requirements of the market.

By volume, Canada occupies third position as contributor to Great Britain's bacon requirements. As regards quality, it may be definitely stated that no bacon has shown more improvement in general quality during the past few years than the Canadian product. This improvement has been brought about largely through the operation of a policy whereby all hogs sold for slaughter are subject to official grading. All stock graded as of "select bacon" type is entitled to a ten per cent premium over the "thick smooth" hogs of equal weight, namely, from 160 to 210 pounds at market.

Since this policy became operative, there has been a marked improvement in the percentage of hogs considered suitable for the best export trade. The consequent demand for bacon type boars and brood sows at the present time exceeds the supply, and during 1923, liberal importations of boars from outstanding British herds were made by Canadian breeders.

Yorkshire breeding predominates in the bacon breeds, although Tamworths and Berkshires, all of improved strains, are prominent.

Canada's swine industry represents the only important source of colonial bacon supply for the United Kingdom. The Canadian Government, in co-operation with the producer and the trade, is sparing no effort to so improve the quality and reliability of the supply, with the probability that, within a few years, the Empire will be more or less self sustaining in the matter of bacon requirements.

Government Aid

The Canadian Government, through the Live Stock Branch of the Dominion Department of Agriculture, spends over $1,250,000 annually in the direct stimulation of production of commercial types of live stock. The Federal policies in this connection include grants to fat stock shows and summer fairs so as to provide adequate money prizes for recognized classes in cattle, sheep and swine.

Improvement in beef cattle production is stimulated through the lending of pure-bred bulls to specially formed farmers' organizations. The value of the bulls placed with these associations to date approximates $600,000. At present, about 1,500 bulls valued at $300,000 are on loan.

The encouragement of the use of well-selected sires, and the provision of an agency through which farmers may procure such sires at the least trouble and overhead expense, are features of the activities of the department. Under this policy, orders are filled for bulls, boars and rams. Farmers not in touch with breeders are thus enabled to secure high quality stock, with the assurance of expert selection.

The Dominion Department, in co-operation with the provincial departments, has been for some years actively engaged in a "scrub-bull" elimination campaign. Through lectures, printed publicity and demonstrations, producers are persuaded to get rid of all sires of poor breeding and to substitute selected bulls, purchasable through government experts. Exchange stables have been operated at central points, and special live stock trains have been run through various parts of the country for demonstration purposes and for the sale of pure-bred stock.

To encourage winter feeding and summer finishing of live stock, and as well to prevent the premature

slaughter of certain classes, the department undertakes to pay the travelling expenses of farmers who desire to purchase stock on the public stock yards. This policy covers cattle, sheep and swine. Up to date, over 79,000 bullocks, 75,000 heifers and 43,000 sheep have been shipped back to country points under this policy.

Where farmers are desirous of purchasing useful breeding heifers, young ewes and young sows, as offered for sale at public stock yards and destined for slaughter, the department pays the carriage charges on the stock, provided the purchases are not made as a speculation. Under this policy, which preserves potential breeding stock from untimely slaughter and, as well, acts as a stimulus to the industry, over 96,000 heifers, 93,000 young ewes and 800 sows have been shipped back to farms.

Boys' breeding clubs have been put into operation, with the object of stimulating juvenile interest in good live stock, thus tending to develop efficient live stock farmers.

The sheep industry is promoted through the application of a number of policies, the object of which is to popularize good breeding sires, and to increase the output of choice meat lambs. Ram clubs are a medium for introducing pure-bred rams in districts where the sheep industry is backward. The Ram Premium Policy aids those purchasing pure-bred rams for the first time. Two annual premiums of five dollars each are paid to farmers who will dock and castrate the offspring of these pure-bred sires. The department undertakes to grade rams for those who are not well acquainted with the requirements of a flock leader. This policy tends to eliminate scrub sires.

Group of Canadian market lambs from car lot winning Grand Championship at International Live Stock Exposition, Chicago, Ill.

Officers of the department encourage the practice of docking, dipping and castrating. Approximately 500 demonstrations are given each year,

attended by about 70,000 people. About 18,000 sheep are dipped by the department's demonstrators.

Sheep feeding competitions are held through the combined efforts of the Dominion and Provincial Departments of Agriculture. Thirty-three competitions of this kind were held in Quebec province last year. Instruction is given in improved feeding methods and in the culling of flocks. Lamb shows and sales are also organized.

Boars are lent to specially formed associations of farmers, as well as to junior pig clubs, in districts where pure-bred sires are not available. Competitions in judging are promoted through liberal money grants to be used as prizes.

THE OUTLOOK FOR DAIRYING

By J. A. RUDDICK, Dominion Dairy Commissioner

THE future of dairying, like the future of any other business, is never very clearly revealed, but there are always some aspects of it that can be referred to with more or less confidence. For instance, there can be no doubt that there is a great increase in dairy production in many parts of the world, and especially in the southern hemisphere.

In this connection, I may point out that in 1914 the northern hemisphere supplied 79 per cent of the butter imported into the United Kingdom, and only 21 per cent came from the southern hemisphere. In 1923, only 44 per cent was from the northern hemisphere, and 56 per cent from the southern hemisphere. In the case of cheese, 60 per cent came from the northern hemisphere in 1914, and only 41 per cent in 1923. These figures and percentages are for the first nine months of each year mentioned. If we go back 20 years, we find that only 2 per cent of the cheese and 7 per cent of the butter came from south of the equator at that time.

The change that has come over the world's production in recent years whereby the southern hemisphere is now exporting more than the northern hemisphere, has upset the old methods of trading and basis of calculation to a very large extent. At one time practically all the butter and cheese consumed by the importing countries was produced in seven or eight months of the year, or during the northern summer. At the present time, there is a more uniform production throughout the year, but if anything, more butter and cheese is now produced for export during the period of the year than less than 20 years ago was looked upon as the non-producing season.

Not only is the southern hemisphere, including countries like New Zealand, the Argentine and South Africa, showing much activity in dairy production, but some of the continental European countries are coming back to pre-war conditions and even exceeding them in some cases. This is particularly true of the new Baltic States, formerly a part of the Russian Empire. Finland, Esthonia, Latvia and Lithuania, which take in most of the country on the Russian side of the Baltic, are making substantial progress in the development of the dairy industry, and their exports are now a factor on the British market. It is estimated that it will be at least ten years before there is a revival of the export of butter from Siberia, which amounted to about 118,000,000 pounds in 1914.

With all this activity in dairy production in different parts of the

world, the situation would be rather disconcerting if it were the only form of activity that has a bearing on the question. It is a fortunate circumstance that concurrent with increase in production, there is a great impetus being given to increased consumption by the newer knowledge of nutrition, and the active propaganda for a greater use of milk and its products in the diet of the human race, and especially the younger element. Those who attended the recent World's Dairy Conference at Washington, Philadelphia and Syracuse, must surely have been impressed with the prominence given to health and nutritional topics. The reading of papers at one session by four of the world's leading nutritional experts, all of whom advocated a greater use of milk, was a fact of enormous importance to the industry. Indeed the Congress was almost as much of a health and nutrition event as it was a gathering in the interests of pure dairying.

Already there are signs that the United Kingdom, the great world's market for dairy produce, is consuming increased quantities of butter and cheese. During the eleven months ended November last, the imports of butter were 533,869,280 pounds as against 409,577,056 pounds for the same period in 1914. This increase of 124,000,000 pounds is partly due to the fact that since April 1923 Irish butter has been included in the imports. The imports of cheese during the 11 months ended November 1923 were 293,209,168 pounds as against 248,142,384 pounds for the same period in 1914.

Although there is undoubtedly a large increase in production in some parts of the world, the increase in consumption seems to be keeping pace with it. Undoubtedly competition is growing keener every day, but I see no reason to believe that Canada will not be able to find a market for all her surplus dairy produce if the quality is right.

The United States Market

So much interest has been shown during the past year in the United States as a possible market for our butter and cheese that a few facts concerning this outlet will be of interest.

The total imports into, and exports from the United States for ten months ended October last, were as follows:

	Imports:	Exports:
Butter	16,871,648 lbs.	4,940,509 lbs.
Cheese	49,240,463 "	7,696,420 "

The net imports were 11,931,039 pounds of butter and 41,544,043 pounds of cheese. Before the war the annual importation of cheese into the United States was about 60,000,000 pounds. They are now making more of the fancy varieties which they used to import. Our share of the United States trade for the same period is shown by the following figures:

	Exported to U.S.	Imported from U.S.
Butter	3,174,138 lbs.	631,832 lbs.
Cheese	2,875,800 "	697,150 "

Our net export to the United States was, therefore, 2,542,306 pounds of butter and 2,178,650 pounds of cheese.

The view that the United States is to become a large importing country, even to the extent of eventually being capable of absorbing our total surplus, is not without supporters. It must be borne in mind, however, that the present high duty was imposed with the object of raising prices, and it seems to me that the premium now being received by United States producers over world's prices will encourage production sufficiently to overtake consumption before long, and that we shall have to continue to look to the United Kingdom as our chief permanent market.

EUROPEAN CORN BORER IN ONTARIO IN 1923

Spread and Degree of Infestation

By W. N. KEENAN, Division of Foreign Pests Suppression, Entomological Branch

THE first year, 1920, that the corn borer was discovered in Ontario, thirty-five townships were found infested, covering an area of 2,780 square miles. In 1921, seventy-one additional townships were added to the quarantine; in 1922, forty-five more were infested and eleven were included in the quarantined territory on account of their situation. The area under quarantine in Ontario at the beginning of the season of 1923, totalled 12,616 square miles, as compared with 13,857 square miles similarly affected in the various infested portions of the United States.

In 1923, scouting of the border territory was again carried on during the months of August and September. All the corn growing townships between Lake Huron, Georgian Bay and Lake Simcoe were examined, as well as the remaining unquarantined townships of the counties of York, Ontario, Durham, Victoria, Northumberland, Peterborough, and Prince Edward. On account of the possibility of water distribution, all the shore townships along the St. Lawrence river, as far down as Cornwall, were inspected and portions of the county of Carleton were also scouted.

As a result of the above inspection only eight additional townships were found to be infested; one in Huron county, three in Bruce, two in Wellington, one in York and one in Durham county. All of the above townships adjoin the quarantined territory with the exception of Saugeen and Kincardine in Bruce county. The Saugeen township infestation represents the most northern point of infestation in Canada, and in this connection it is interesting to note that several hills of corn were found infested in the field, whereas at the other points discovered this year, only isolated stalks were found infested. The northern spread along Lake Huron again demonstrates the relative importance of lake shore conditions in corn borer distribution, and an effort will be made to watch the development of the pest in the township of Saugeen.

Possibilities of Further Spread

From the viewpoint of food supply, it is, of course, possible that the European Corn Borer may spread over a much larger area in the province of Ontario than it covers at the present time. The reports of the foremen of the scouting parties, who worked Grey county in the past two seasons, would indicate that the interior of this county does not grow corn to any extent. Dufferin county is also unimportant as well as northern and western Simcoe county in general. Northern Ontario county, Victoria county and northern Peterborough county may be similarly classified, but corn is a sufficiently important crop in various other uninfested sections of the province to warrant efforts being made to retard the spread. An important portion of Wellington county is still uninfested, a large amount of corn is grown in the shore townships of Lake Simcoe, the townships bordering the quarantined territory in the counties of York, Ontario, Durham, Northumberland, southern Peterboro', and Prince Edward usually grow a large acreage of corn, and the townships along the St Lawrence river would supply a sufficient amount of corn to favour the development of an outbreak. The counties of Glengarry, Prescott and Russell are somewhat important. The county of Lanark grows about 11,000 acres, and the county of Carleton

ranks fifth in importance in the province in silage corn production, with about 18,000 acres.

Degrees of Infestation

With the exception of a limited area in the centre of the infestation, where accurate records were made by Messrs. Crawford and Spencer during the investigational work, no special effort was attempted until last year to record the actual degree of infestation in the older portions of the infested territory. The work in this connection last season was carried on after the completion of the border scouting in late September. Observations were made at various points in three concentric circles surrounding Union Village, the centre of the infestation. On account of the small staff available and the fact that the corn was then being cut, the records were taken from only one field at each locality. An effort was made to locate the most heavily infested field at each point, and the degree of infestation was obtained from 300 representative stalks together with relating data regarding the history of the field. This method did not show the average conditions, but substantiated the original decision regarding the centre of the outbreak and verified established opinions concerning the benefit of late planting.

In 1923, a definite system of recording the development of the infestation was inaugurated with the intention of continuing the work for several seasons to supply accurate information regarding the importance of the pest under the varied soil and crop conditions encountered in the large territory affected and to locate local outbreaks. Definite points in approximately the same three circles as used last year were chosen, and include the counties of Elgin and Middlesex and the western parts of Oxford and Norfolk. In addition, various points in the counties of Essex, Huron, Perth, Oxford, Welland, and Lincoln have been included in this season' records.

The method of crop handling and climatic conditions are apparently very favourable for the corn borer in a large proportion of the infested territory. In 1920, the first year of discovery, accurate infestation records were taken from only a small area, due to the late date at which investigational work was started. One field near Port Stanley showed 99 per cent of stalks infested. Ten miles west, the heaviest infestation to be found was one per cent, and beyond that the degree diminished rapidly. The north and northeastern spread were somewhat greater than the above and New Sarum, about ten miles from Union, showed approximately five per cent stalk infestation. A marked increase occurred in all sections in the central area in 1921 and, as noted above, the infested territory extended to sixty-five additional townships.

In 1922, 100 per cent stalk infestation was very common near the control area, and in the records taken on the inner concentric circle, within a radius of six to eight miles from Union, the per cent stalk infestation varied from 10·6 per cent on the northeast and 90·3 per cent on the west to 100 per cent on the east. The second circle radiating about fifteen miles from Union, showed degrees of infestation varying from 7 per cent to 77 per cent, the highest occurring on the west, in Dunwich township. The third circle, covering localities within a radius of thirty miles of Union, showed infestations ranging from zero to 6 per cent, the highest being on the west, in Aldborough township.

As stated previously, our 1923 records were obtained in a different manner from those of 1922. It is possible that individual fields between the record points would show a greater degree of infestation than

any of those studied. Nevertheless the survey will represent, as near as possible, the average intensity of infestation. The season's circle records cannot be compared accurately with last year's, but they will serve as a basis for standard records in future seasons.

In obtaining the 1923 records, the five nearest fields to a definite " cross road " point were examined. One hundred stalks were examined from three different parts of the field, in the case of the records from the three circles. One thousand stalks were examined from various parts of the fields concerned at the several points in the other counties. The following is a summary of the conditions noted:—

Area	Highest Percent Infestation	Lowest Percent Infestation	Average Percent Infestation	Total Fields Examined
Circle No. 1 (6-8 miles)	68·0	4·33	30·16	55
" No. 2 (15 miles)	47·0	0·0	16·97	80
" No. 3 (30 miles)	7·66	0·0	1·93	135
Essex County (80-110 miles)	13·66	0·0	1·31	48
Huron County (50-70 miles)	1·4	0·0	0·3	12
Lincoln County (95-115 miles)	0·6	0·0	0·2	15
Norfolk County (east) (45 miles)	1·2	0·0	0·32	5
Oxford County (40-45 miles)	2·8	0·0	0·93	15
Perth County (50-60 miles)	1·3	0·1	0·57	10
Welland County (95-115 miles)	4·4	0·0	1·06	45

NOTE.—Mileage stated represents distance from Union village, the centre of infestation. Wellard county first found infestation in 1920 and apparently a separate infestation.

In comparing the season's records of circle No. 3 with those of 1922, a very marked increase is evident, especially in a north and northeast direction and in the districts near the lake on both the eastern and western edges. The increase, in the outside circle, is also demonstrated by the fact that the average infestation in the 135 fields in the outside circle is now 1·93 per cent, whereas two and three years ago our inspectors had to search the majority of the field in most cases to find an infested stalk.

In 1923 a careful consecutive field examination, chiefly in the counties of Elgin and Middlesex, was carried on under the direction of Professor Caesar, Provincial Entomologist of Ontario. Records were taken from every field along the main road running south to north between Union and Lucan, a distance of thirty-five miles, and also west to east between St. Thomas and Delhi, a distance of thirty-six miles. The following is a summary of the results:—

District	Distance	Average Infestation	Number Fields Examined
	miles	per cent	
North and South Records—			
Union—St. Thomas	5	25·9	30
St. Thomas—north	5	26·2	26
St. Thomas—north, 5-10 miles	5	18·3	22
St. Thomas—north, 10-15 miles (London)	5	21·5	16
Vicinity of London		20·8	16
London—north	5	6·1	20
London—north, 5-10 miles	5	1·6	9
London—north, 10-16 miles	6–7	1·6	8
East and West Records—			
St. Thomas—New Sarum	5	25·9	18
New Sarum—Aylmer	6	26·5	31
Aylmer—east	8	19·1	36
East to Tilsonburg	8	12·8	6
Tilsonburg—east	5	2·1	10
East to Delhi	5	1·6	12

As Essex county is the greatest corn-growing county of the province, with a corn acreage of 80,000 acres, the conditions there will naturally be of interest. Mersea township was found infested in 1921 and infested stalks were difficult to locate. The remainder of the county was scouted but nothing was found. In 1922, col-

lections were made in each remaining township. Many fields of corn were examined in the central and northern townships before larvæ were discovered, but in the southern townships collections were more easily made, although the infestation was extremely light. Our records in Essex county last season show a decided increase. Standard records were taken from five fields at eight points in the shore townships and also at Pelee Island, the results of which are as follows:—

Township	Locality	Highest Percent Infestation	Lowest Percent Infestation	Average Percent Infestation
Mersea	Hillman	5·5	2·2	3·48
Gosfield S.	Ruthven	1·2	0·3	0·86
"	Arner	0·4	0·0	0·14
Colchester S.	Oxley	0·8	0·0	0·34
"	Harrow	0·4	0·2	0·28
"	Marshfield	0·9	0·0	0·42
Malden	Comet	0·9	0·0	0·42
"	Malden Centre	0·6	0·0	0·3
Pelee Is.	Misc. (8 fields)	13·66	0·33	5·89

Pelee Island was found infested in 1921. The degree of infestation was very low at that time. In 1922, the Pelee Island conditions were not studied, but the survey of 1923 showed a remarkable increase, and the infestation was much more intense than that of the neighbouring mainland.

The infestation in Welland county, first found in 1920, is increasing, but much more slowly than in the western territory. The results of the records in the other counties listed also indicate an increase, although an exact degree of comparison is impossible, owing to the lack of necessary information.

In reference to the 1923 increase, in territory near the centre of the outbreak, it has been most important to the north and east. The relation of the corn borer to the corn-canning industry in general has always been regarded with anxiety. This recent development is unfortunate in that it has affected canning-corn crops in the Aylmer region very seriously. The infestation in all other canning districts is as yet comparatively light.

In 1920, the degree of infestation in the districts from which the Aylmer canning factory received its corn supply would average five to ten per cent stalk infestation. In 1921 various canning corn fields ran from 21 per cent to 74 per cent ear infestation. In 1922 the factory refused material with ten per cent ear infestation, with the result that corn was refused from one or two fields and two loads from other fields were turned back. This year the situation became serious. Corn delivered to the factory by twenty-two growers on September 4 was examined. Notwithstanding the fact that practically all growers had already culled from five to thirty per cent in the field, the corn presented to the factory varied in ear infestation from six to fifty-six per cent, and from two to forty-three per cent of the cobs showed actual feeding. As a result of this condition, a special control campaign was started in the district under the personal direction of Professor L. Caesar, Provincial Entomologist.

The European corn borer has already established its importance as a serious corn-crop pest in approximately one thousand square miles of territory in Ontario. In Massachusetts, it is causing serious financial losses, through infestation in other crops, in addition to corn, and the

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development of similar conditions in portions of the Ontario infested area is regarded as possible.

Greater efforts were made this season in the enforcement of the quarantine which gave further assurance of the importance of infested table corn transportation as a means of spread. One phase of the quarantine work consisted of automobile inspection. During the week-ends a total of 1,434 automobiles were held up at different points on the quarantine border and ninety dozen ears were seized. Seventeen ears were found infested.

In 1921, the township of Pickering in Ontario county was found to be infested, and in 1922 a collection of the borer was taken in Brighton township, Northumberland county. These outbreaks were situated some distance from the nearest infestation discovered in the years mentioned, and were very probably due to the movement of infested material. The difficulty of teaching control methods and the financial outlay involved is naturally associated with the size of the infested territory, and the extent of crop losses is likewise similarly affected. A large corn-growing acreage in Ontario is still uninfested and southwestern Quebec grows corn abundantly. It is therefore necessary to expend every effort possible to prevent the artificial spread of the pest to new districts, by means of strict quarantine enforcement.

DOMINION EDUCATIONAL CHEESE AND BUTTER SCORING CONTESTS, 1923

By GEO. H BARR

THE year 1923 witnessed the holding of the first Dominion Educational Cheese Scoring Contest. The contest was open to a limited number of factories per month in each province and covered the period May to October inclusive. The provincial dairy authorities named the factories participating in the contest. The rules called for the entry of one cheese from each factory. It was stipulated that different factories should be named each month, and that the cheese should be made between the 1st and 10th of the month. Only fifty-six factories entered the contest, although the monthly quota from the provinces entering was as follows: Ontario 4; Quebec 4; New Brunswick 1; P.E. Island 1; Alberta 1.

Upon arrival in Montreal, the cheese was placed in cold storage at a temperature of 36 to 38 degrees F., and scored a few days later.

The following is a detailed report of the contest:

NUMBER OF SAMPLES IN EACH GRADE BY PROVINCES

Province	Total Samples	Special Grade	First Grade	Second Grade
Ontario	22	4	17	1
Quebec	21	9	9	3
Alberta	3	.....	1	2
New Brunswick	6	.....	4	2
P. E. Island	4	.....	4	
Total	56	13	35	8

PERCENTAGE OF SAMPLES BY GRADE

Special Grade	23·22	per cent
First Grade	62·50	"
Second Grade	14·28	"

AVERAGE SCORE FOR FLAVOUR AND TOTAL SCORE BY PROVINCES

Province	Number of Samples	Average Score for Flavour	Average Total Score
Quebec	21	40·25	94·66
Ontario	22	40·07	94·27
P. E. Island	4	39·37	93·62
New Brunswick	6	38·61	92·95
Alberta	3	38·50	92·06

STANDING FOR WORKMANSHIP, BY PROVINCES (Based on the Score for Texture, Closeness, Colour, Finish. Total 55 points.)

Province	Average Scores	No. of Samples
Quebec	54·42	21
New Brunswick	54·33	6
P. E. Island	54·25	4
Ontario	54·21	22
Alberta	53·57	3

RESCORES FOR FLAVOUR

The following table shows the average of the scores for flavour on the samples from each province in May, June, July and August and the average of the rescores in these samples when they were two months old:

Province	Average Scores	Average of Rescores	Difference
Ontario	40·03	39·68	0·35
Quebec	39·68	39·73	0·18
New Brunswick	38·87	38·00	0·87
P. E. Island	39·50	39·33	0·17
Alberta	38·25	38·50	+0·25

The following table shows the average of the scores for flavour on the May and June samples and the average of the rescores when the samples were four months old:

Province	Average Scores	Average of Rescores	Difference
Ontario	39·85	39·57	0·28
Quebec	39·70	39·60	0·10
New Brunswick	38·75	38·00	0·75
Alberta	38·25	39·00	+0·75
P. E. Island	39·50	38·00	1·50

THE BUTTER SCORING CONTEST

The Dominion Educational Butter Scoring Contest has been carried on each year since 1919; the principal object of the contest being to establish a uniform type and quality of creamery butter throughout the Dominion. The creameries participating each year were selected by the provincial dairy authorities. The samples were shipped to Montreal, placed in cold storage and scored a few days after arrival. The result of five year's work cannot be described better than by stating that in the month of October, 1923, a 14 pound box of butter was sent from each of the nine provinces and every box was placed in Special grade. This, together with the fact that in the 1923 contest the number of Special grade samples was 23·4 per cent greater than in 1922 and 50·65 per cent greater than in 1920, proves that the creamery butter makers of Canada have improved their methods of making butter to a very remarkable extent during the past five years.

An effort is made to place in the hands of every creamery manager in Canada a copy of the churning record of every sample of butter sent to the contest and the above mentioned results are due very largely to the buttermakers following the methods used in making the highest scoring butter.

In the 1923 contest, which covered the six months from May to October inclusive, 49 creameries participated as follows: Prince Edward Island, 3; British Columbia and New Brunswick 5 each; Alberta, Saskatchewan, Manitoba, Ontario, Quebec and Nova Scotia, 6 each.

NUMBER OF SAMPLES IN EACH GRADE, BY PROVINCES

Province	Total Samples	Special Grade	First Grade	Second Grade
British Columbia	5	2	3	.....
Alberta	6	4	2	.....
Saskatchewan	6	5	1	.....
Manitoba	6	6	.....	.....
Ontario	6	4	2	.....
Quebec	6	5	.....	1
New Brunswick	5	3	2	.....
Nova Scotia	6	6	.....	.....
P. E. Island	3	1	1	1
	49	36	11	2

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PERCENTAGE OF SAMPLES BY GRADE

Special Grade	73·47 per cent
First Grade	22·45 "
Second Grade	4·08 "

AVERAGE SCORE FOR FLAVOUR AND TOTAL SCORE, BY PROVINCES

Province	Number of Samples	Average Score for Flavour	Average Total Score
Manitoba	6	42·21	97·01
Nova Scotia	6	42·08	96·88
Quebec	6	41·25	96·10
Saskatchewan	6	41·51	95·90
Alberta	6	41·05	95·30
Ontario	6	41·55	95·23
New Brunswick	5	40·70	95·20
British Columbia	5	40·00	94·54
P. E. Island	3	40·00	94·46

STANDING FOR WORKMANSHIP, BY PROVINCES (Based on the Scores for Texture, Incorporation of Moisture, Colour, Salting and Packing. Total 55 points.)

Province	Average of Scores	No. of Samples
Quebec	54·85	6
Manitoba	54·80	6
Nova Scotia	54·80	6
British Columbia	54·63	5
New Brunswick	54·50	5
P. E. Island	54·46	3
Saskatchewan	54·38	6
Alberta	54·25	6
Ontario	53·68	6

RESCORES FOR FLAVOUR

The following table shows the average of the scores for flavour on the samples from each province in May, June, July and August and the average of the rescores on these samples when they were two months old:—

Province	Average Scores	Average of Rescores	Difference
British Columbia	40·00	39·33	0·67
Alberta	41·37	40·30	1·07
Saskatchewan	41·80	40·12	1·68
Manitoba	41·82	41·12	0·70
Ontario	41·40	39·62	1·78
Quebec	40·80	40·12	0·68
New Brunswick	40·62	39·00	1·62
Nova Scotia	42·12	40·62	1·50
P. E. Island	38·90	38·50	0·40

NOTE.—The score for P. E. Island is on the May and June samples only.

The following table shows the average of the scores for flavour on the May and June samples and the average of the rescores when the samples were four months old:—

Province	Average Scores	Average of Rescores	Difference
British Columbia	39·50	39·75	+0·25
Alberta	41·25	39·50	1·75
Saskatchewan	42·15	40·00	2·15
Manitoba	41·65	40·00	1·65
Ontario	41·30	39·00	2·30
Quebec	42·00	40·50	1·50
New Brunswick	41·25	39·00	2·25
Nova Scotia	42·75	41·25	1·50
P. E. Island	38·90	37·25	1·65

COW TESTING RESULTS

IN studying Canadian herd records for the past four years, it is encouraging to note that there have been some substantial increases in the average milk and fat production of herds that have been tested regularly. Not all tested herds have shown increased production during this time; but where no improvement is in evidence, the inference is that the owners failed to make use of the information available.

The following table shows the gain in average production in a number of herds where improvement has taken place:

Herd No.	Province	Average Production			
		1919		1922	
		Milk	Fat	Milk	Fat
		lbs.	lbs.	lbs.	lbs.
1	P. E. Island	5,990	217·6	7,884	280·1
2	P. E. Island	7,146	252·9	10,218	349·0
3	New Brunswick	4,197	219·6	5,527	275·9
4	Nova Scotia	4,044	169·1	5,554	234·7
5	Quebec	6,682	254·2	8,164	320·3
6	Quebec	5,240	199·4	7,067	264·1
7	Ontario	6,432	218·0	10,285	346·4
8	Alberta	4,593	168·2	8,359	254·6

THE BRITISH EMPIRE EXHIBITION

THE Experimental Farms Branch of the Dominion Department of Agriculture will be represented at the British Empire Exhibition by a model Experimental Farm surrounded by typical scenic work. The space occupied will be 40 by 60 feet. The model will be to scale, and complete as to buildings, fences, roads, shelter belts, rotation fields, experimental plots, live stock, and horticultural sections. A display will be made of sheaves of grains, forage crops, fruits, etc., originated, improved or introduced by the Branch. Transparencies, pictorial and otherwise, will give further information as to the services rendered, and a booklet will be distributed for the information of prospective settlers and others.

The exhibit to be made by the Dominion Live Stock Branch will occupy a space of 128 feet long by eight feet deep. Canadian bacon will be featured in an attractive manner in co-operation with the Canadian Packers, who will keep the exhibit supplied with this commodity.

The stocker and feeder business will be presented by means of scenes showing (1) Cattle on Canadian summer pastures, (2) Cattle on the western range in winter, and (3) Canadian cattle after their transfer to British pastures.

Displays will be made of Canadian poultry, eggs and wool. Canadian egg standards will be depicted, as well as the Canadian system of recording the performance of poultry. The wool and textile exhibit will include an exhibit of wool from the Prince of Wales' ranch in the Province of Alberta. Numerous transparencies will illustrate Canadian farm scenes and typical specimens of live stock.

The Seed Branch of the Department of Agriculture has collected an exhibit of seed from commercial sources and plant breeders to exhibit at the British Empire Exhibition for the purpose of showing this branch of Canadian industry and stimulating trade in the export of hardy, northern-grown Canadian seed within the Empire and to Northern European countries.

There have been secured for this exhibit the prize winning samples from national and international seed shows, including the championship wheat, oats and peas at the Chicago International, which were all Canadian-grown exhibits. The plant breeders have supplied samples of Elite stock seed representing the main kinds and varieties originated by them and those in process of improvement. From commercial sources, including the Canadian wholesale seed trade, larger exhibits have been secured showing high grades of cereal grains, alsike and other clovers, grasses, peas, beans and corn, representative of the qualities of this season's crop, and available for export in car lots.

Some 3,000 boxes of apples have been collected by the Fruit Branch to represent Canadian fruit at the exhibition. The display will be set up and maintained by the Exhibition Branch of the Department of Trade and Commerce.

OATS SCALPINGS STANDARDIZED

By GEORGE H. CLARK, Commissioner, Dominion Seed Branch

THE constantly growing demand for recleaned grain screenings is ample evidence that the lack of confidence in this material on the part of Canadian feeders is rapidly being outgrown. This condition is attributable to several factors—the Feeding Stuffs Act, which forces removal of deleterious weed seeds and of chaff and dust; the introduction into mills and elevators of improved grain and screenings cleaning machinery; the classification and standardization of screenings, and a wider recognition on the part of the trade that the proper cleaning and grading of this material is essential to the establishment of a ready and steady market.

There is one class of grain cleanings standardized by the Board of Grain Commissioners and sold under the name "Oats Scalpings" which has not yet found a wide market in Canada but which is increasing in popularity and demand as it becomes better known. The average sample weighs from 36 to 38 pounds per bushel and consists of from 50 per cent to 75 per cent of wild oats with a total of from 70 per cent to 90 per cent of wild and domestic oats combined. The remainder is made up of wheat, barley and other coarse grains recovered along with the oats and wild oats, in the process of cleaning the wheat. It is evident, therefore, that for utility purposes Oats Scalpings are comparable with the feed grades of oats.

The principal objections of feeders to screenings are the lack of uniformity as between different shipments and the danger of spreading noxious weeds. Oats Scalpings, however, vary but little in composition except in the proportion of oats to wild oats, any increase in the percentage of the former usually being balanced by a corresponding decrease in the percentage of the latter. Furthermore, unlike most other classes of screenings, oats scalping are practically free from fine weed seeds, hence excessively fine grinding, entailing high power and special machinery, is not so necessary as with the other classes. An additional advantage is that oats scalpings either whole or ground may be obtained at the flour-mills as well as from the elevator, particularly at those mills of larger capacity which are equipped with modern cleaning and grinding machinery.

FLOUR MILL BY PRODUCTS PROHIBITED IN MIXTURES

By GEO. H. CLARK, Seed Commissioner

THE application of the amendment to the Feeding Stuffs Act respecting the sale of flour mill by-products has given rise to considerable complaint from feed manufacturers and consequent difficulties to the Department of Agriculture in connection with the enforcement of the amendment since it became effective on October 1, 1923. The amendment was construed by the Department of Justice to prohibit the hitherto common and much complained of practice of adding screenings to bran, shorts and middlings, and further, to make illegal the use of any flour mill by-product from wheat in the manufacture of any mixed feed. Manufacturers engaged exclusively in the blending of commercial mixed feeds urged that this latter was an incorrect interpretation, and that, even if cor-

rect, such a provision was neither contemplated nor intended by Parliament and could not be applied without inflicting hardships on live stock and poultry feeders as well as on themselves.

In the circumstances it was deemed expedient and was agreed that, while no registrations would be granted for mixed feeds containing any of the flour mill by-products, a reasonable time would be allowed to manufacturers to dispose of stocks on hand, and for all affected to adjust themselves to this new situation.

Since this issue first arose, at which time opinions varied widely as to what application of the law was just and in the best interests of the live stock and poultry industries, considerable discussion on the subject has taken place. Contrary to the claims of the manufacturers on behalf of live stock and poultry feeders, opinions expressed and resolutions adopted by the latter indicate a strong feeling in favour of the law as it now reads. The viewpoint is urged that it is of first importance to live stock and poultry feeders that they be able to secure pure wheat by-products of standardized quality as provided for in the law, and they feel that the object of this provision would be prejudiced by allowing the use of wheat by-products in mixtures, since it would permit the common and wasteful practice of combining valuable wheat by-products with inferior materials to be sold as registered commercial feeds under attractive names.

Considering all the circumstances, the Department finds itself compelled to continue to refuse registration on mixed feeds containing flour mill by-products, and to take what action may be necessary to secure compliance with this provision of the law unless and until Parliament indicates that such an application is more far-reaching than was intended or is now considered necessary.

PART II

Provincial Departments of Agriculture

THREE YEARS OF FIELD HUSBANDRY PROGRESS IN SASKATCHEWAN

By MANLEY CHAMPLIN, Professor of Field Husbandry, University of Saskatchewan

THE three years 1921 to 1923 have been years of testing in the world at large. Those countries have succeeded best in this struggle for existence and for a return to happy conditions where the qualities known as self-reliance and individual initiative have been found to be still alive. And in those countries where self-reliance has been coupled with a desire to co-operate with one's fellow workers the signs of a successful and happy ending to the era of economic distress are already apparent.

In the qualities of self-reliance and the desire for helpful co-operation, Saskatchewan has not been found wanting. It has been my experience among the people with whom I have had the pleasure of dealing to find that the old self-reliant spirit is still alive, that the new generation is not all centering its attention upon the God of Jazz, nor the older generation upon the ogre of Despair.

To prove this I want to recount some of the things that have been done during the past three years in field husbandry, the basic industry of this province. Progress does not mean consummation, nor does going forward mean arriving at the goal, but nevertheless, progress is worth noting, if for no other reason than to encourage us and stimulate us toward better efforts.

Cropping Conditions in 1920

You all know the conditions that existed in the fall of 1920. The crops had been short for two years. This served to aggravate and emphasize a condition which had been suspected all along, namely, that the system of farming in vogue made no provision for maintaining soil fertility. No pains had been taken to leave a binder of fibre in the soil. The soil rose up in rebellion in the dry spring of 1920 in many districts and brought attention to itself in a most forcible manner.

When the price slumped in the fall of 1920, it served to emphasize the fact that cost of production had been unduly high. When signals of distress came from the terminals at Fort William because the dockage dumped into the lake in hugh quantities threatened to ruin the public health by contaminating the water supply, it brought home to us the fact that clean seed and clean land were still as important as they used to be.

When penniless harvest hands were supported during the winter out of the public treasury, it reminded us that there are bad features about a labour situation that requires large numbers of transients. And many things verified the belief that the system in use did not distribute the income from month to month or from year to year as it should be distributed.

Planning the Attack

Through the winter of 1920 and 1921, people in all parts of the province were considering these problems and seeking various solutions. Three lines of attack on the redoubtable fortresses surrounding these problems were suggested. Two of these were dependent upon the self-reliance and

initiative of the individual; the third required co-operation. The first line of attack consisted in strengthening and increasing the supply of good seed, thus getting help from the force of heredity and taking a step toward weed control. The second consisted in developing methods of growing crops which would enable them to be readily fitted into good crop rotations, thus distributing labour and income better and giving an opportunity to control weeds. The third consisted in organizing for the purpose of marketing products in a way that would insure receiving the real value for the product to be sold and at the same time, to give the consumer a more dependable service.

Strengthening the Seed Supply

While it cannot be said that all goals have been fully attained, the following facts demonstrate that progress has been made. In the effort to strengthen the seed supply, a very careful review of all available data was made and certain pedigreed strains, or superior varieties, were designated for distribution. These included Marquis, Sask. No. 7 wheat, Banner, Sask. No. 144 oats, and Prolific spring rye among the grains. Arctic, Sask. No. 439 sweet clover and Grimm Sask. No. 451 alfalfa among the leguminous crops. Will's Dakota White Flint and Will's Northwestern Dent among the corn varieties. There were a number of other sorts which were used to serve a well defined purpose in strengthening the seed supply. Several thousand pounds of seeds were distributed for 1921. In 1922 the amount increased to about 80,000, and in 1923 to nearly 115,000 pounds. These seeds were grown from hand picked stocks and in most cases were hand picked when shipped to co-operators. The prices for these seeds were fixed at a reasonable figure to enable the small oprator to get a start as well as the large one. It was felt that this practice was justified because of the increase in wealth that could be expected in the whole province as these seeds came into common use through multiplication.

In order to avoid the loss of this seed through the product being sold on the market and shipped away, a careful follow-up system was used. In the first place all purchasers of seed who lived in Saskatchewan or in nearby territory were enrolled as members of the Saskatchewan Field Husbandry Association. Through the co-operation of the Field Crops Branch of the Saskatchewan Department of Agriculture, it was possible to have most of these seed growers visited by representatives of that branch. The Department of Agriculture also assisted by providing funds for the appointment of a director of co-operative experiments who has made it his duty to visit and assist the growers in any way possible.

In addition to this assistance from the department at Regina, we have urged our co-operators to make use of the seed registration system provided by the Canadian Seed Growers' Association, which works in close harmony with the Dominion Seed Branch. As a result, the number of acres inspected for registration increased from about 4,000 in 1919, to about 20,000 in 1922 and over 16,000 in 1923. The decline between 1922 and 1923 is explained by the fact that the Dominion Seed Branch took over the work of field inspection in 1923 and changed the policy of inspecting small fields for registration. The new plan is to inspect only the fields of those who expect to have seed for sale. This cuts out all the people with small multiplying fields of first-generation seed and thus reduces the acreage inspected, although the actual acreage of eligible seeds is larger than ever. The quantity of seed pased by the inspectors for registration in 1923 amounts to 350,000 bushels and

represents over half a million dollars in value of the seed itself, to say nothing of the improved crop it will produce.

Progress Toward Crop Rotation

The only way to have crop rotation and participate in its manifold benefits is to have crops that will readily work into a good rotation, so planned that each crop in it will help put the land in condition for the succeeding crop. This means that we must have cultivated crops, legume crops and staple grain crops, and grasses are also useful. If we once get in the habit of growing crops of the various classes, crop rotation will come as surely as dawn follows darkness.

With this idea in mind, Saskatchewan farmers have been growing grain in rows, increasing their corn acreage and their fields of sweet clover. It is impossible to know just how extensively this movement has taken place. But from my correspondence and travel, I feel convinced that there were close to a fifth of a million acres of grain in rows, sown as a cultivated crop, and over 100,000 acres of corn in the year 1923. From 70 acres of grain in rows in 1920 to 200,000 in 1923 is real progress. From 16,000 acres of corn in 1920 to 100,000 in 1923 represents substantial gain. Thus the problem of finding a cultivated crop for our rotations is being solved.

Let us now examine into the state of affairs with regard to soil improving crops. Here it is a little more difficult to form even approximate estimates. Most of the farmers are taking hold of sweet clover, alfalfa, rye grass, and brome grass somewhat cautiously. This is as it should be. Many of the fields are small so that it is hard to guess the acreage. But my correspondence leads me to believe that there are at least 5,000 farmers trying sweet clover. The fields range in size from one to one hundred acres. Probably 20,000 acres is not too high a figure for the sweet clover. This premier soil binder and soil awakener is increasing in importance every year.

According to estimates of the statisticians at Ottawa, over four-fifths of a million acres were seeded to tame grass for pasture and hay in Saskatchewan in 1923. While this represents a decline of a fifth of a million acres since 1920, I am inclined not to regard this as retrogression. Doubtless, much of the grass sown in 1920 failed to make a stand and never came into bearing. Other fields have been ploughed up after having been down to grass a few years and have been worked into the rotation, which, after all, is just what we want. There are certain simple facts about securing a stand of grass which are not well enough known or understood and we have taken pains in hundreds of letters and scores of press articles to reiterate and repeat those precautions that are necessary to help insure success in seeding grass.

Alfalfa, the queen of forage crops, is still suffering in much the same way that most of our cities are suffering. It has not yet absorbed the effects of a premature boom, which it experienced in the days when everything else was booming. Many at that time attempted to grow alfalfa without taking the precaution to learn something about it first. They were not to be blamed for this as there was no source of accurate information about growing alfalfa on the prairies in those days. I can well remember that nearly everything I learned about alfalfa growing fifteen years ago had to be revised. It was based upon the experience of those who were growing the crop in mountain valleys rather than on the open prairie. Besides that, it was hard to get genuine, hardy seed. Hardy seed is still too expensive. Some who suc-

ceeded in producing a good stand destroyed it by pasturing or cutting too closely in the fall, thus taking away its winter protection. Despite all these setbacks, interest in alfalfa is awakening. Here and there people are trying it. They are asking questions about it, and a bulletin has been prepared, but not yet printed, giving up-to-date proven facts about alfalfa.

The sunflower crop has also come in for a share of attention. Dairymen especially have found it a valuable feed in the form of silage. These immigrant plants from Russia produce such an enormous total per acre that a few acres suffice for a large herd of cattle. The acreage has expanded from a few hundred in 1920 to nearly 4,000 in 1923.

Thus the province of Saskatchewan is working toward the crop rotation ideal. With enough cultivated crops and enough soil-improving crops to balance the grain crops, crop rotation will gradually come about.

Silos and Silage

With the increased acreage of corn and the advent of sunflowers has come a marked increase in interest in the silo as a means of preserving these crops in the form of succulent feed. In 1920 there were less than 100 silos in the province. By 1923 the number, including trench silos, had increased to several hundred, probably not less than 1,000. This, too, means progress, as the silo is regarded as a necessary part of the farm equipment of a well-rotated farm.

Co-operative Marketing

The progress that has been made toward co-operative marketing of the wheat crop through a voluntary pool is remarkable. When we consider the vast distances involved, the bad roads to be traversed, and the legal entanglements that had to be straightened out, the progress made is gratifying to say the least. It has become almost an axiom that farmers are so individualistic that they cannot co-operate to advantage. In Denmark, those who believed in this axiom have been forced to the conclusion that farmers after all are essentially the same as other folks and that they can and do co-operate to mutual advantage. In Saskatchewan we cannot point to the accomplished fact, but can show real, substantial progress toward co-operation in the marketing of our key product.

Conclusion

Self-reliance and individual initiative, coupled with a desire to co-operate, is each doing its part toward the solution of Saskatchewan's problems in field husbandry. Crop heredity is one of the forces that is coming to our aid, through a continuous improvement of the seed supply. Crop rotation is another tremendous power for good which will eventually be invoked and impressed into our service through the increasing acreages of cultivated and soil-improving crops.

Silos for the preservation of succulent feeds have increased by at least 1,000 per cent, and are rapidly becoming part of the equipment of the progressive farm.

The co-operative wheat pool has overcome many obstacles and stands to-day as a remarkable example of what can be done in a short time and as a disavowal of the long-credited opinion that farmers cannot co-operate.

Do these things smack of "The whisper of death"? Do they not rather demonstrate that, in so far as Saskatchewan is autonomous, that in so far as her destinies are within the control of the people who live upon her soil, Saskatchewan is living up to the meaning of her name and is "Swiftly Flowing," rapidly progressing toward better things in field husbandry, her basic industry.

BRITISH COLUMBIA POTATO SHOW AND EDUCATIONAL SEED EXHIBIT

By J. B. MUNRO, B.S.A., Soil and Crop Instructor

THE consistent increase in the number of entries at the British Columbia Potato Show from year to year indicates the steady progress of the potato industry as well as the keen interest that the growers are taking in their work in the Pacific Province. From a humble beginning three years ago, when eight potato entries were made, ninety-seven entries the next year and two hundred and seventy-three entries at the first actual potato show a year ago, the entries mounted up to a total of four hundred and four at the Second Annual Potato Show held in November, 1923, at Victoria, B.C. This increase is particularly gratifying in view of the fact that only certified seed potatoes were allowed in the seed classes, and the number of varieties in the commercial classes was considerably reduced.

The recent show was a complete success from the viewpoint of both the exhibitor and the spectator, and through the educational work, conferences, meetings and publicity given the industry during potato fair week, this branch of agriculture has received a decided impetus. The potato work being done in British Columbia is attracting the attention of those interested in potatoes, not only in this Province but in the Pacific Northwest States and in other provinces of Canada.

The Potato Show was held by authority of the Honourable E. D. Barrow, Minister of Agriculture, under the direction of Mr. Cecil Tice, Chief of the Soil and Crop Branch, with the assistance and co-operation of the Victoria Potato Growers' Association and Chamber of Commerce. The British Columbia Department of Agriculture is much indebted to the officials of Dominion Experimental Stations for their efforts on behalf of the Potato Show and the potato industry as a whole in this Province.

A comprehensive programme including addresses on potato growing and marketing problems, the production of quality field and garden seeds, and the organization of growers for purposes of controlled production and distribution was carried out. The speakers included Hon. E. D. Barrow, and Dr. D. Warnock, Deputy Minister of Agriculture, as well as the following authorities in their respective branches:

R. G. Newton, Supt., Dominion Experimental Farm, Invermere, "Experimental Work with Potatoes"; R. G. L. Clarke, Chief Dominion Fruit Inspector, Vancouver, "Root Vegetables Act as Applied to Potatoes"; P. W. Anketell-Jones, Chemainus, B.C., "How to Grow an Acre of Potatoes"; J. W. Eastham, Provincial Plant Pathologist, Vancouver, B.C., "Potato Diseases"; P. A. Boving, Professor of Agronomy, U.B.C., Vancouver, "Soils, Fertilizers and Rotations for Potatoes"; J. A. Grant, B.C. Markets Commissioner, Calgary, Alberta, "Marketing"; F. M. Clement, Dean of Agriculture, U.B.C., Vancouver, "Industrial Combination"; A. McMeans, Dominion Seed Inspector, Vancouver, "The Seed Situation in B.C."; J. Travis, Manager, United Seed Growers, Penticton, B.C. "Seed Production and Marketing"; W. C. Edmundson, Superintendent, Potato Experiment Station, Greeley, Colorado, "Seed Improvement".

The vast agricultural area of Central British Columbia was well represented by exhibits of potatoes from several districts along the line of the

British Columbia Potato Show: Part of the Certified Seed Exhibit.

Canadian National Railways between Prince Rupert and Prince George. This section of the Province is being developed agriculturally and its possibilities were well presented by H. G. Perry, M.L.A., of Prince George, and Col. R. D. Davies, of the British Columbia Land Settlement Board, both of whom gave addresses at the potato and seed meetings. The educational exhibit of grains and field seeds sent in from this district by A. E. Richards of the Dominion Experimental Farms Branch, illustrated the agricultural possibilities of Central British Columbia.

Among the innovations at the recent fair were some features of educational value to the farmers. The potato grading demonstrations, conducted by Inspector Robert Murray of the Dominion Fruit Branch, gave a practical illustration of the method of grading commercial potatoes and emphasized the need of grading. The field, garden and flower seed exhibits placed by the United Seed Growers, the Department of Agronomy of the University of British Columbia, and by many individual seed producers, gave the visiting public a fair idea of what the Province is doing in the production of quality seeds. Sweet pea seeds were a feature of the flower seed section. The preparation of various potato dishes was demonstrated by a domestic science specialist, and was a center of attraction to housewives throughout the week. A potato judging competition for adults, as well as one for boys and girls, was staged, and many contestants took part. In the latter competitions the eight winners were girls.

Competition was strong in the district displays, there being eight districts represented by eight lots of potatoes from each district. The premier trophy, a challenge cup presented by the Farmers' Institute Advisory Board, was won by the Windermere Valley, showing Cambridge

Russet and Wee McGregor varieties. The Gordon Head district exhibit, composed of Sir Walter Raleigh potatoes, took second place, while Comox Valley was third with Burbank and Green Mountain varieties. The other five districts, while not winning prizes, made a favourable showing and closely followed the winners.

Six Women's Institute locals exhibited as Institutes, showing the potatoes grown by six members of each local. The Women's Institute not only organized and showed the product raised by their members but they provided the trophies allotted to this class.

As a result of winning the highest aggregate points in four specified classes, the Victoria Potato Growers' Association carried off the challenge cup presented by the Windermere Potato Growers' Association.

As an outcome of the several meetings and conferences held in connection with the Potato Show, two province-wide associations have been formed. One is an organization of the certified seed potato growers of the Province, which has elected provisional directors and has already commenced a campaign for the systematic organization of the seed potato industry throughout British Columbia. The other organization is for commercial potato growers and will be completed during the early months of 1924, in time, it is hoped, to greatly influence the distribution of the 1924 potato crop. The price of certified seed potatoes has been set for the coming year at a minimum of $50 per ton f.o.b. shipping point.

The climax of the week's activities was the banquet held the closing night of the fair presided over by Speaker F. A. Pauline of the Provincial Legislature, and attended by the Premier, Hon. John Oliver, Mr. W. J. Bowser, leader of the Opposition, and the Hon. E. D. Barrow, Minister of Agriculture. Addresses were given by the above named gentlemen and others. The presentation of trophies was made to the winners by the Honourable John Oliver.

PRODUCTION AND SALE OF HONEY IN THE PROVINCE OF QUEBEC

By C. VAILLANCOURT, Chief of the Apicultural Service, Department of Agriculture

THE annual production of honey in the Province of Quebec amounts to 3,500,000 pounds of extracted honey and 300,000 pounds of comb honey.

Some years ago the Quebec beekeepers formed The Beekeepers' Co-operative Association for the sale of their product. Part of the revenue of this association is used to advertise honey and to stimulate its consumption. The association lately amalgamated with the "Co-opérative Fédérée de Québec," and their product is now sold through the latter organization.

The members of the Beekeepers' Co-operative Association ship their product to warehouses in Montreal, Quebec and Three Rivers, where it is graded according to a grading system adopted by the association. There are five grades: white honey No. 1, white No. 2, clear amber, amber, and brown. Thus, honey is sold acording to quality.

The association has also adopted uniform packages for the domestic trade, and those who purchase honey in lithographed pails, bearing the mark of the Fédération Apicole de

Québec, are sure of having a pure product of a superior quality.

The following is a summary of the association's regulations: To be eligible for membership, one must produce at least 300 pounds of honey; belong to a beekeepers' association recognized by the Federation; pay an entrance tax of ten cents per hive with a minimum of $1.

In addition to the necessary expenses for the sale of honey, which amount to about one cent per pound, each member must pay to the association half a cent a pound on the honey sold through the Co-operative Association. This contribution is used for advertising purposes.

When the honey is shipped to the Co-operative, each member receives an advance of at least 40 per cent on the value of the shipment, based upon the average price. At the end of the year the proceeds of the sales are averaged and settlement is made for the balance to each member.

If the honey supplied by a member is not equal to the standard adopted by the association, or if any member should try to deceive the association in any way, the association may keep 75 per cent of the price of all the honey sold for that member, and if the Board of Directors so decide, the member may be suspended or permanently debarred from membership.

The results anticipated by the organization are being fully realized. Last year Quebec white honey sold for 13 and 14 cents per pound. An export trade has also been developed, but it is not our main object. We are especially endeavouring to develop our local market and already have reason to be proud of the results.

Any member of the association is at liberty to sell his own honey, if by so doing he can get a higher price than that offered by the association, but if the price is the same, the honey must be disposed of through the Association.

During the last two years, thousands of pamphlets on the use of honey in cooking were distributed, and other forms of advertising have been undertaken to promote demand for the product.

MOTION PICTURES IN SASKATCHEWAN

AGRICULTURE being the basic industry of the province of Saskatchewan, it is only natural that the Department of Agriculture should make wide use of moving pictures in instruction work. They are used in all short course work carried on by agricultural representatives in the province and also by the Extension Department of the University of Saskatchewan in connection with the agricultural courses conducted during the winter at various points in the province. The films exhibited deal with practically all phases of agriculture. Among them are pictures illustrating the co-operative marketing of live stock, showing the progress of the animals from the farm to the stockyards, the care of poultry and the candling of eggs, the construction of trench silos, cream grading, the embryology of an egg. Films showing the good points of horses, bulls, milch cows, give the observant an education in what to look for when selecting these animals. Farm boys get a lot of useful information from films of this character, and put it to good use at the farm boys' camps when the live stock judging competitions are in progress. A combination of the practical and aesthetic is found in the film showing the proper method of tree planting, with the object of demonstrating how farm surroundings can be made more attractive.

BRITISH COLUMBIA COW TESTING

DURING the past year the Dairy Branch of the British Columbia Department of Agriculture has put in practice two new ideas to lend interest and value to their cow testing work. One of the new plans, that of issuing certificates of production for grade cows, was instituted in the Wisconsin Cow Testing Associations some three or four years ago, but this is the first time that such records have been recognized in Canada. The other innovation is that of tattooing heifer calves so that a record may be kept of them as they become milkers, and also to enable a record to be kept of the dam and sire and to properly value them as breeding stock.

In order to tattoo a heifer calf and have her registered, it is necessary that the sire be pure bred and that the dam should have a certificate of production or have finished a lactation period which qualifies for a certificate. Heifer calves only are to be tattooed, and only those born since January 1, 1923.

Certificates of production were issued for the year 1922, and for 1921 if the records were on file at the Dairy Branch, Victoria. To qualify for a certificate of production, the cow must be tested regularly from the time she freshens until she goes dry; she must freshen within fifteen months of her previous calving date; and she must produce not less than 6,000 pounds milk and 300 pounds fat.

In 1922, there were 343 certificates issued for records completed previous to January 1, 1923. They were distributed in four of the associations.

These two ideas should give a decided added interest to cow test association work in British Columbia. Dairymen with good grade cattle will be able to secure recognition, and more or less semi-official records will be possible for pure bred cattle not tested under Record of Performance.

The tattooing of heifer claves will enable the owners and officials in charge of cow test associations to keep a record of the calves as they grow up, and also to keep records of the sires of these calves. In this way, it will be possible to save the good sires, and to dispose of the poor sires as the records of their heifers become known.

PART III

Agricultural Education and Related Activities

AGRICULTURAL EDUCATION IN MANITOBA

By R. W. MURCHIE, M.A, Professor of Rural Sociology, Manitoba Agricultural College

THE story of Agricultural Education in Manitoba may be treated under three headings: (1) The Manitoba Agricultural College; (2) Extension work of the College and of the Department of Agriculture; (3) Junior work in elementary and high schools.

(1) Agricultural College

The first attempts at agricultural education in the Province were made in connection with the Dairy School in the winter of 1896 and succeeding winters. The aim of this school was to train specialists who would take charge of creameries and cheese factories throughout the province.

A more comprehensive course in Agriculture was recommended by a commission appointed by the Provincial Legislature in 1902, and to carry out this recommendation the Manitoba Agricultural College was built near Winnipeg and formally opened in 1906. In the following year it was affiliated with the University of Manitoba and provision was made for the granting of a degree in Agriculture (B.S.A.) to students completing the five-year course. In 1912 the College severed its connections with the University and was given degree-conferring powers, but re-affiliation was brought about in 1916. The rapid increase in attendance compelled the authorities to provide a new home and, in 1913, commodious and well-equipped buildings were erected four miles south of the city of Winnipeg, at a cost of approximately four million dollars. This capital cost as well as the cost of maintenance is borne entirely by the Province. Each year the Provincial Government makes an appropriation of over $300,000 for maintenance charges exclusive of interest.

The governing body of the College is a Board of Directors, of whom five are appointed by the Lieutenant Governor-in-Council, and four by associations representing the agricultural interests of the Province.

The curriculum is comprehensive. The five-year course leading to the degree gives opportunity for specialization. A three-year course leading to a diploma in Agriculture is also included. This course is specially designed to give boys a training both in the science and art of agriculture and to fit them for rural citizenship.

Courses in Domestic Science and Domestic Art were instituted in 1910 and later developed into a five-year course leading to a degree in Home Economics. The first class graduated in 1917.

The College also conducts extensive experimental, investigational and research work, and provides many short courses of a technical nature.

(2) Extension Work

The Extension Service was first organized in connection with the College in 1906. In 1917 it was put under the direct control of the Department of Agriculture, but in 1923 was re-established as a branch of the Agricultural College.

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This Extension work includes superintending of Agricultural Societies and short courses throughout the country, oversight of Women's Institutes, and general educational work with adults, such as institute meetings. The agricultural representative service was also under this branch, but this has been discontinued, temporarily at least, owing to economic conditions.

Two of the notable features of the extension work are the short courses both in Agriculture and Domestic Science, which have proved very popular throughout the country, and the demonstration trains. The first trains ran in 1911 and succeeding years to 1914. These were "better farming" trains, giving instruction and demonstrations in many lines of agriculture. More recently, specialized trains have been run such as the Live Stock Special Train in which such organizations as the railway companies, the Live Stock Exchange, the Winnipeg Packers, the Pure Breed Association, and both Federal and Provincial Governments co-operated. The object of this type of train is not only to give instruction and demonstrations for better live stock raising but to provide opportunities for the purchasing of pure bred animals.

Much of this extension work is financed through the grant made by the Dominion Government.

(3) Junior Work

Just prior to the war, some attempts were made to introduce special agricultural instruction into the rural high schools and the consolidated schools. Agricultural specialists were attached to the staff of schools such as Roblin, Dauphin, Holland, Stonewall, and Teulon. The outbreak of the war, however, and subsequent economic conditions forced the abandonment of this scheme, and the only school now giving a full course in agriculture is the Teulon Consolidated School. In this school the course runs over three years with one-half day per week each year. In Grade IX, Entomology and Horticulture are featured, in Grade X, Farm Botany and Field Crops, and in Grade XI, Live Stock including Poultry.

In other schools Nature Study is being given considerable prominence. The elementary schools of Manitoba are also attempting to teach some Agriculture in Grades VII and VIII, but no special supervision is given this work except the general oversight of the school inspector; and only a small percentage of the teachers can teach this efficiently.

In Brandon Normal School, Principal Hales has for many years included in his curriculum courses in Agriculture and Nature Study and has developed the school garden idea amongst the students, but none of the other Normal schools in the Province has any equipment for this type of training. A summer school is conducted at the Agricultural College under the direction of the Department of Education, and courses in Agriculture and Home Economics are included in this school.

The most important educational work amongst the young is that accomplished by the Boys' and Girls' Clubs. This movement began in 1913 and grew very rapidly until, in 1919 and 1920, the membership was about 30,000. In the earlier years manual training, poultry, calf and pig raising were very popular, and the projects now included in this movement cover practically every phase of Agriculture and Home Economics. In the last few years, however, a new development has taken place and, in addition to exhibiting at the school fair, the Boys' and Girls' club members prepare themselves to give demonstrations. The following subjects are amongst the most popular: canning, dyeing, millinery, baking, milk bever-

ages, hot lunches, and labour saving devices.

Interest in this work is kept up by interdistrict competitions, and the teams making the best showing in each district are given a free trip to Winnipeg where they compete for Provincial honours.

Live Stock Judging is very popular with the boys, and the teams compete at the Provincial Exhibition, Brandon.

Another recent development from the Boys' and Girls' Club is the Pig Club, which consists of the school children who are preparing for market a number of bacon hogs. These hogs are shipped simultaneously from all points to Winnipeg Stock Yards and judged there by car load lots.

The Boys' and Girls' Club when organized was operated under the Extension Service at the Agricultural College and later by the Extension Service under the Department of Agriculture in co-operation with the Department of Education. In the recent re-organization, Boys' and Girls' Club work is placed entirely under the Department of Education.

In addition to the $300,000 mentioned above, which is appropriated for the Manitoba Agricultural College, the Provincial Government spends another $140,000 in agricultural educational work, exclusive of administration. The annual grant under the Agricultural Instruction Act is $78,000, making a total in round numbers of over half a million dollars.

AGRICULTURE IN THE SCHOOLS OF ALBERTA

By F. S CARR, Inspector of Schools

FOR many years, in fact ever since Alberta was granted provincial status, the subject of Agriculture has had a prominent place on the curriculum of the Public School. In a province like Alberta, where the rural interest and industry bulk so large in comparison with the urban interest and industry, the necessity for including rural science as a subject for school study requires no argument.

During the early years of the growth of the school system, instruction in agriculture was limited to the last year of the public school course; instruction was formal in the extreme. In a few cases exceptional teachers, each on his own initiative, developed his course to include excursion work and school gardening, a development that justified itself in each case. In fact to the success of these teachers may be ascribed the extension of the work to the last two years of school life and the use of the school garden and experimental plot as outdoor laboratories.

Along with this development of the course in Agriculture in the Public School to include so much practical work, there arose the need for teachers who could interpret this course properly for the pupils. To supply this demand two highly important steps were made by the Department of Education. To equip properly those teachers already at work, the Summer School for Teachers was instituted, an organization at present of such size and complexity that very often the reason for its existence is forgotten; to equip those who intend to make teaching the life work and those who graduated from the High School with a knowledge of the sciences underlying Agriculture, this subject was made a part of the high school course. However, it was soon realized that the use of the high school for university matriculation purposes and that the use of the high school training for purely cultural purposes modified this action; as a result Agriculture like the other sciences became one of the optional subjects.

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In the meantime changes have taken place in the viewpoint of the relationship existing between the school and the home. It is recognized that the life of the province depends on agriculture in one phase or another. It is self-evident that every boy and girl should have the opportunity to catch a glimpse of some of the factors controlling this great industry. The school is the place where this may be done best, and it is here that the knowledge of the child may be correlated with this activity that touches every home in the province.

The greatest difficulty lies in the inability of so many to distinguish between practical and vocational, between the art of the subject and its science; in short, to distinguish between agriculture and farming. It must be realised that this subject teaches the application of the sciences, that it develops an interest in home activities, that it teaches the child to see interesting things about work away from the cities, and that it provides a stimulus to the pupil to work out his own individuality. At present the public school is endeavouring to carry out these ideals. The student starts with a foundation of home experiences, each one has his interest held by the fact that the work is practical and definite, and at the same time the child is allowed to work out his own ideas through the various home projects.

There are two courses outlined for the public school. In those schools where such subjects as the manual arts are taught, a general course in Agriculture has been provided. In this course a great deal of the elementary science learned in the previous six grades is viewed in a new light—in its direct relationship to the agricultural activities of the locality. Plants are studied as weeds or plants of use; animals are studied as harmful or beneficial; the soil is studied from its value as a home for plants instead of in its place as part of the assembly making up the world. On the other hand, for schools such as consolidated schools an agricultural course has been designed—a course that can offer more advanced work suitable for those who have already acquired much of the art of farming in the daily experiences of living. The general course has been followed in outline, but so enriched that the student completing it has sufficient knowledge to understand many of the reasons underlying this farm practice, and sufficient training to work out many others for himself.

In short the course in Agriculture in the public schools uses as a foundation the knowledge already in the possession of the pupil. For example, in the booklet work, his training in art and manual arts enables him to go about his project in a workmanlike way; the content is also made up of his personal experiences in his home life. All the work thus centres about activities with which the child is most intimately associated, whether this is canning vegetables, hatching eggs or raising a pig. This knowledge then is used as a starting point for the experimental work, the teaching and the student's reading.

In the High School, at present there is but one year of Agriculture. This is during the third year. There is being considered a re-arrangement of the whole course, and until these changes are made known, it would be most unwise to enter into a discussion. At present the content is such that the student may build on the training in the sciences received in the previous years, and apply this training to the special case of Agriculture. In addition, considerable stress has been laid on the actual doing of a few things essential to the comprehension of the subject, such as gardening projects, milk-testing, soil examinations, etc.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

CANADIAN LIVE STOCK INDUSTRY

The Handling for Meat Production of Sheep and Swine through the Stock Yards and Abattoir System. Article II

By E. B. ROBERTS, Editor of The Industrial and Development Council of Canadian Meat Packers

OWING to their carcases being convenient units for smaller dealers, the Canadian trade in swine, sheep and lambs differs from that in beef animals. A larger percentage of the live animals is taken by small packers and by wholesale butchers. More hogs and sheep than cattle are slaughtered on farms either for family use or for sale at country markets. Hence the turnover of the public stockyards is not quite so accurate a measure of the total trade in pork, mutton and lamb as it is in the case of beef.

Only live stock bought by packing firms under government supervision and inspection enters into the export trade. Such product alone can carry the government guarantee of wholesomeness implied in the stamp, "Canada Approved". Yet only a part even of these purchases is prepared for the overseas market; the bulk goes into the domestic trade.

The Bacon Hog

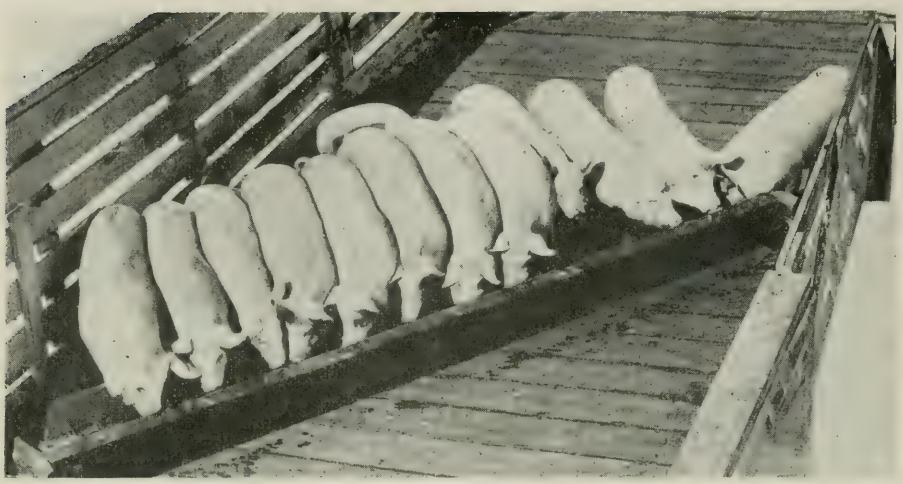
Bacon forms the chief article of Canadian meat exports. The statistical tables demonstrate this fact. Its successive steps from farm to shipside in Canada, and its subsequent progress when imported into Great Britain are worth outlining.

But first a brief digression on definitions. Throughout Canada the old term "hogs" (of Celtic origin, traceable in Welsh and Erse to-day) is used in the general sense for all swine comprehended in the term "pigs" (a word of Dutch origin) in Great Britain. When "pigs" are mentioned in Canada, the word is usually employed as "piglets" is in England; when "hogs" is the word used it is in no way restricted, as the sense sometimes is in England, to castrated males, for which the common Canadian equivalent is barrows. "Pigs," of course, "is pigs" but in Canada they're hogs.

Marketing and Grading.—Hogs are usually sold by the farmer-producer to a drover, who gathers the lots at the country railway station where he makes up a car lot or railway waggon load, a number that may run from 65 to 90.

For over a year a system of grading hogs has been in force under the direction of the Dominion Department of Agriculture. Nine main grades have been defined, and all hogs on stockyards are classed into one or other of these, and payment is usually made on the graded basis; elsewhere it is not so general.

The ideal in this setting of hog standards is the "Select" bacon hog. This is defined as one that "weighs 160 to 210 pounds at the stockyard



A Litter of Thirteen all graded as Select Canadian Bacon Hogs.

Carcases on the packing house rail of the thirteen Select Bacon Hogs shown alive in the accompanying picture.

or abattoir, of a type and finish indicating suitability for the production of choice bacon or 'Wiltshires' for export". Price, however, is based on the animal classed as the "Thick Smooth", of the same weight and general quality of flesh as the "Select", but owing to difference in conformation, generally a shortness of body, one that will not yield a carcase with the requisite length for the English market. Since the object of grading is the raising of standards, meat packers, when the system was instituted, voluntarily agreed to pay more for the "Select" bacon class than for those classed as "Thick Smooth". For the other classes there are graduated discounts. Should the drover sell to local butchers not purchasing on stockyards, no grading is necessary, but the product can enter domestic trade channels only. Once the carlot is consigned to the public stockyards or direct to the packinghouse, it must be graded by independent officials, appointed by the Dominion Government. Their classification is entirely a matter of eye judgment. There is, of course, a certain margin of error, but on the whole the system has worked with fair satisfaction since it was inaugurated in November, 1922, and it is now being steadily extended.

Slaughter and Inspection.—At almost every Canadian packinghouse a part of the hog supply is delivered direct by farmer's car or motor truck. The limit range of collection seems to be about 25 miles. Owing, however, to the occasional severity of the Canadian winter, the state of the roads is often a factor of more importance than the actual distance.

Slaughter is machine-like in its method. As a rule the actual killing place is on the top floor of an abattoir. The advantages of this will be indicated. Some firms keep all hogs of one grade apart from others, but practices differ. Pig after pig comes forward on automatic conveyors and passes before the killer. In a few minutes bleeding is complete and the carcase—one advantage of starting on the upper floor—is slid down the chute into the scalding vat. After the proper immersion, the carcase is picked up on a forward-moving flat bed or feed belt, about five feet wide, and conveyed into the dehairing machine. This is not unlike a large drain pipe laid horizontally. As the scalded carcase goes head foremost through the pipe, the bristles are slapped off by quickly revolving flappers or beaters fitted to the inner surface of the pipe. When it emerges, it is again hitched to a chain and drawn up through another pipe-like tube, arranged vertically, on whose inside surface are strong jets of gas flame which singe off any hair that may have escaped the beaters. This gives a thin, delicate rind to the bacon. There is also a certain chemical action caused by heat on the outer skin which is of considerable importance for the retention of the juices in the bacon at the rind. Following the singeing, the carcase is scraped clean and washed by men handling flexible scrubbing brushes through which jets of water shoot. Here begin the various cutting up processes, removal of the head, viscera and so on.

At this point also begins government veterinary inspection, which, on the whole, does not differ materially from that described for beef animals in an earlier section of this descriptive article. The selfsame care is exercised in keeping apart from the good all carcases or cut-off parts suspected of unfitness. If there is the least doubt, tags with the word "Held" are pinned immediately on both the carcase and the dissevered parts. These must then come under the personal scrutiny of the senior inspection officer. If the damage is only local and unimportant, the por-

tion may be cut out and the remainder passed. If, however, it is not passed, it is tagged "Condemned", and in that case the whole carcase or portion goes into the steaming tank to be made into fertilizer.

At every step in a well conducted abattoir the advantage and economy of having the slaughter performed on the top floor is apparent. As each part is removed from the hanging carcase, it is placed upon a travelling table, 30 to 40 feet long, and is scrutinized by the inspector as it passes steadily forward. When approved and passed, each part is dropped through a different chute into its respective place on the storey beneath, and is then dealt with according to trade needs. The carcase, with head removed and split down the back bone into two halves, passes into the cooling room. Indeed, from the moment it came out of the scalder or singeing machine until ready for the brine cellar, it has been hanging on the same hook, carried round by an overhead endless chain, each workman doing successively his allotted job as it moves onward.

Curing.—The sides are sorted into classes according to their suitability for domestic or export trade. Those intended for Canadian home consumption are dissected into somewhat different "cuts" from those customary in England, but the sides suitable for London and Liverpool are trimmed into the "Wiltshire" cuts. These are branded with the firm's trade designation and processed,

Perfect type of 80-pound Canadian bred Market Lamb.

giving enough pickle to permit the sides being transported to the seaboard and across the Atlantic, eventually to English smokehouses. Contrary to the general belief in the Dominion, bacon for English consumption is not smoked in Canada; that is done entirely after it arrives in Great Britain by agents of the exporting firms or by bacon curers who handle it according to their ideas of what will suit the trade and the customers for their own particular brands.

Disposal.—Bacon is not to any extent sent to Great Britain "on order." It is sent subject to sale at market price on the day of its arrival, whether that be high or low. Packers, therefore, have to "take a chance" on profit, for they have no sure means of forecasting a bacon market in England a month or six weeks after they purchase the live hogs at the prevailing market prices on Canadian stockyards.

The home market absorbs the bulk of Canada's hog product. Now that domestic demand is being fully met, it is evident that, to be profitable, any further increase in live hogs on farms should be of the "select bacon" type suitable for the export trade.

Sheep and Lambs

For sheep and lambs much the same method of slaughter obtains, except that there is no compulsory grading system. Nor is there scalding or dehairing, the pelt being removed by three or four men each "doing his bit" while the hanging carcase passes before him. (The modern meat packing industry would certainly have furnished Adam Smith with as good an example of the division of labour as his classic instance of the pin makers in "The Wealth of Nations.") Inspection for wholesomeness is made, as in all cases, by Dominion veterinary officials who are responsible only to the Dominion Minister of Agriculture.

From the accompanying tables it will be seen that the quantity of Canadian mutton exported to Great Britain since 1914 has been small compared with the exports to the United States. These statistics also make evident the fact that the total export trade is almost offset by an import trade in the same meat product. The seasonal nature of supply is one of the causes for this seeming anomaly, while the wide expanse of the Dominion, lying east and west for 3,000 miles along the northern frontier of the United States, is another factor. In many localities there is a market for farmers just across the international boundary, while it may be 1,500 miles to the nearest Canadian stockyard. The same facts influence trade "on the hoof" in sheep and lambs. For instance, there is in the Atlantic Provinces an important trade in lambs sent by rail or water to the Boston and New York markets. Somewhat similar conditions rule in British Columbia and in sections, at least, of the Prairie Provinces. This interchange is likely to continue despite the interplay of tariffs.

Excepting on the western ranches, the number of sheep kept on Canadian farms is rarely large; in fact, there are few that equal the number on an average farm in Scotland or Wales. The per capita consumption of mutton and lamb in the Dominion is about one-third that in Great Britain, though in fresh pork, due largely to climatic conditions, consumption is far larger.

In the immediate post-war years of 1920 and 1921, large quantities of frozen lamb and mutton were imported from New Zealand. This was part of the accumulated war stock. Sales, however, were disappointing to the consignors. The ingoing of the items is shown in the table of imports for 1920 given herewith, and their outgoing in the table for exports for the years 1921-22.

The following tables gives the yearly number of swine and sheep in the Dominion since 1914:

NUMBERS OF SHEEP AND SWINE IN CANADA, 1914-1923

Year	Sheep	Swine
1914	2,258,445	3,434,261
1915	2,038,662	3,111,900
1916	2,022,941	3,474,840
1917	2,369,358	3,619,382
1918	3,052,748	4,289,682
1919	3,421,958	4,040,070
1920	3,720,783	3,516,678
1921	3,676,000	3,905,000
1922	3,262,500	3,915,500
1923	2,753,860	4,405,316

The following table gives the numbers of sheep and swine slaughtered in inspected packing plants in Canada since 1914:

NUMBERS OF SHEEP AND SWINE SLAUGHTERED IN INSPECTED PLANTS, 1914-1923

Fiscal year	Sheep and lambs	Swine
1914	499,280	1,799,060
1915	447,173	2,598,338
1916	403,147	2,363,693
1917	416,575	2,245,511
1918	336,897	2,126,862
1919	397,961	2,334,354
1920	601,170	2,171,650
1921	682,680	1,686,059
1922	654,705	1,727,296
1923*	499,745	2,256,474

NOTE—*Calendar year.

EXPORTS OF PIG MEATS, 1913-1923

Fiscal year	Bacon Exports	
	Lbs.	Values
		$
1913	36,212,190	5,350,845
1914	23,859,754	3,763,196
1915	76,801,419	11,811,825
1916	144,918,867	25,710,767
1917	207,213,267	43,011,439
1918	199,957,475	57,995,116
1919	120,622,092	39,046,058
1920*	223,642,600	70,123,580
1921	98,233,800	31,492,407
1922	99,208,000	23,012,480
1923	101,590,100	22,536,397

EXPORTS OF PIG MEATS, 1913-1923—*Concluded*

	Ham Exports	
	Lbs.	Values
		$
1913	2,426,654	322,669
1914	1,890,182	269,911
1915	17,958 874	2 652,917
1916	8,732,857	1,379,346
1917	4,403.244	766,595
1918	7,875 523	2,087,378
1919	4,066,649	1,196,117

NOTE.—*Hams included with bacons from 1920 onward.

	Pork (All)	
	Lbs.	Values
		$
1913	521,533	57,960
1914	1,811,204	202,391
1915	21,288,226	2 599,844
1916	13,142,169	1,990,856
1917	13,987,460	2,522 926
1918	7,909,803	2,052,192
1919	37,318,106	11,711,024
1920	6,680,300	1,641,570
1921	3,125,700	802,472
1922	2,924,800	453,708
1923	2,670,500	451,682

MUTTON EXPORTS—QUANTITIES 1914-1923

Fiscal year	To United Kingdom	To United States	All Countries
	Lbs.	Lbs.	Lbs.
1914	.....	53,571	65,167
1915	.....	1,029,021	1,064,963
1916	.....	45,973	99,593
1917	89,240	44,543	167,993
1918	184,513	589,625	855,517
1919	.....	.....	.....
1920	320,800	4,658,600	6,140,100
1921	.....	6,242,100	6,405,500
1922	773,000	6,998,800	7,877,000
1923	.....	3,502,200	3,610,000

MUTTON EXPORTS—VALUES

Fiscal Yean	To United Kingdom	To United States	All Countries
	$	$	$
1914	.....	9,471	10,804
1915	.....	119,911	124,087
1916	.....	7,800	14,360
1917	13,452	9,185	27,491
1918	47.225	128,273	192,224
1919	.....	.....	.....
1920	51,887	1,027,172	1,314,573
1921	.....	1,595,111	1,595,111
1922	122,177	1,198,783	1,342,146
1923	.....	827,426	847,233

IMPORTS OF MUTTON AND LAMB INTO CANADA—QUANTITIES

Fiscal year	United Kingdom	United States	All Countries
	Lbs.	Lbs.	Lbs.
1914	251,287	3,821,777	5,610,812
1915		2,955,582	3,451,812
1916		2,715,338	2,841,838
1917		2,458,104	2,458,104
1918		1,742,606	2,298,630
1919			
1920		2,365,105	4,842,904
1921		2,910,737	7,847,701
1922		2,630,357	3,416,332
1923		1,147,018	1,460,130

IMPORTS OF MUTTON AND LAMB INTO CANADA—VALUES

Fiscal year	United Kingdom	United States	All Countries
	$	$	$
1914	25,151	425,941	566,794
1915		335,933	370,330
1916		325,217	334,856
1917		360,972	360,972
1918		355,296	418,040
1919			
1920		490,182	803,774
1921		562,806	1,272,165
1922		420,794	533,005
1923		226,384	261,382

The following table gives the quantity of Canadian bacon and pork imported into Great Britain yearly since 1908 as reported by the British Board of Trade:

IMPORTS INTO GREAT BRITAIN OF CANADIAN BACON AND PORK, 1908–1923

Year	Bacon	Pork
	Lbs.	Lbs.
1908	68,776,000	249,000
1909	44,339,000	310,000
1910	41,194,000	198,000
1911	61,581,000	97,000
1912	38,740,000	43,000
1913	24,352,000	4,000
1914	34,228,000	55,000
1915	86,419,000	5,849,000
1916	159,411,000	10,198,000
1917	176,708,000	12,279,000
1918	171,974,000	5,539,000
1919	209,425,000	33,106,000
1920	167,217,000	1,540,000
1921	94,531,000	409,000
1922	82,575,000	395,700
1923	99,230,100	2,072,000

NOTE—The British import classification differs somewhat from the Canadian export classification.

PRODUCTION OF SLAUGHTERING AND MEAT PACKING ESTABLISHMENTS, CANADA, 1920, 1921 AND 1922

Kind		1920	1921	1922
Meats sold fresh—				
Beef	lb.	297,297,955	264,356,063	292,945,201
	$	55,239,777	35,636,366	28,240,355
Mutton	lb.	46,941,632	34,043,637	32,512,028
	$	10,297,988	6,693,557	5,973,139
Pork	lb.	75,686,123	77,668,607	89,948,380
	$	21,669,071	16,601,197	16,691,166
Veal	lb.	22,571,511	19,535,961	27,490,961
	$	4,592,955	2,950,410	3,375,827
Other	lb.	10,563,374	5,069,370	8,000,208
	$	2,095,773	790,823	925,245
Meats cured—				
Beef, salted or cured	lb.	8,977,202	563,564	2,956,599
	$	1,679,524	73,310	274,985
Pork, salted	lb.	45,170,076	40,843,257	34,573,593
	$	13,276,170	9,147,740	7,334,710
Hams	lb.	44,392,002	19,707,184	24,751,907
	$	15,801,386	6,316,990	6,452,580
Shoulders	lb.	32,799,091	55,735,498	19,385,422
	$	10,131,900	13,685,897	3,714,678
Bacon and sides	lb.	96,128,042	55,433,782	66,366,742
	$	36,772,497	17,381,025	17,424,984
Other cured meats	lb.	10,015,800	10,650,154	43,875,012
	$	3,244,753	2,756,795	9,366,306
Sausage, fresh and cured	lb.	28,547,527	23,045,178	24,456,021
		6,353,748	4,274,777	3,815,190
Sausage casings	$.	*	*	746,552
Canned meats	lb.	6,396,305	7,457,028	5,386,571
	$	1,591,447	1,451,856	1,028,905
Cooked meats	lb.	11,800,363	14,237,793	13,657,643
	$	5,189,585	6,006,393	5,065,946
Lard	lb.	54,451,386	72,151,773	49,338,784
	$	14,950,621	11,751,806	7,670,130
Lard compound	lb.	**	**	15,733,230
	$			2,145,929
Shortening, other	lb.	**	**	17,743,822
				2,518,317
Tallow	lb.	14,051,223	13,996,919	13,436,257
	$	2,031,904	868,243	1,004,172

*Included with all other products. **Lard compound and other shortening included with lard.

PRODUCTION OF SLAUGHTERING AND MEAT PACKING ESTABLISHMENTS, CANADA
1920, 1921 AND 1922—*Concluded*

Kind		1920	1921	1922
Oleo	lb.	2,631,050	5,538,080	2,407,950
	$	1,720,777	1,075,292	238,909
Other oils	lb.	*	*	7,011,971
	$	.....	.....	774,399
Oleomargarine	lb.	10,565,055	3,024,625	2,326,986
	$	3,673,072	755,053	435,784
Stearine	lb.	9,371,518	645,891	91,765
	$	2,347,516	75,669	10,557
Animal tankage	tons	12,171	14,068	13,630
		607,358	366,838	480,807
Bones, raw, ground, etc	tons	5,699	2,784	8,843
	$	480,864	104,377	314,131
Complete fertilizers	tons	7,370	6,322	2,595
	$	573,656	238,768	145,107
Glue	lb.	29,379	.....	2,549
	$	8,042	.....	445
Glue stock	lb.	.....	379,278	.....
	$	.....	7,645	.....
Hides	No.	.....	.....	552,744
	$	10,561,070	2,827,309	4,190,944
Skins, sheep	No.	607,937	647,435	496,316
	$	1,270,488	405,258	517,914
Skins, calf	No.	121,685	155,114	254,180
	$	445,445	230,233	391,193
Wool	lb.	450	161,585	17,550
	$	67	59,203	460
Hair	lb.	2,357,802	1,689,391	1,010,200
	$	174,440	94,735	42,438
All other products	$	13,748,422	10,445,539	11,923,540
Amount received for custom or contract work	$	14,393	63,185	178,949
Total Value of Production	$	240,544,618	153,136,289	143,414,693

*Other oils included with oleo.

CLEANING GRAIN AT THE THRESHER

Results of Experiments with a Portable Disc Recleaner Conducted by the United States Department of Agriculture in 1923, from the Report of the Specialists in Charge of Grain Cleaning Investigations.

A SURVEY based on the reports of 1,400 elevators in Minnesota, North Dakota, South Dakota and Montana shows that the percentage of dockage in the 1923 crop of spring wheat marketed by farmers up to November 1, in these four states is 7·6. This means that 11,650,800 bushels or the equivalent of 13,980 carloads of dockage were hauled in the wheat to the country elevators in the Central Northwest. A large part of this dockage should have been cleaned out and used for feed on the farm. In one state, the average wheat farmer harvested, threshed and marketed a half peck of weed seeds with every bushel of wheat.

If this dockage had been removed before marketing, a saving equivalent to a materially increased price per bushel for the wheat would have been received for the clean wheat. The spring wheat farmers, in South Dakota, Minnesota, and North Dakota who cleaned their wheat before marketing gained at least 7·3 cents per bushel as a result of the cleaning.

A Suitable Cleaner

Experiments have been carried on for several years to build a cleaner suitable for use at the thresher, in the Central Northwest. To clean grain satisfactorily as part of the threshing

operation requires a cleaner of large capacity, which will remove the dockage and other foreign material without appreciable loss of grain, and do this as fast as the grain is threshed.

Five types of cleaners were used in the 1923 experiments to develop cleaners for use at threshing machines as fast as the grain is threshed. These five types were: a large portable disc recleaner, deck disc recleaners, a sieve or large fanning mill type, a Bates aspirator and a deck cylinder type.

The portable disc type cleaner designed for the 1923 experiments, and the only one described in this report, was found to be well suited for cleaning wheat and rye as part of the threshing operations in the principal spring wheat states. The portable type of disc cleaner was evolved from the experiments during the two previous years with the deck type of disc cleaners.

In the 1921 and 1922 experiments, disc cleaners were attached to the decks of the threshing machines. The 1923 experiments were conducted with a disc cleaner having slightly different construction of discs and housing. A double-leg elevator was added, and the cleaner and elevator were driven with a gasoline engine. The cleaner, elevator and gas engine were all mounted on a four-wheeled truck, making a complete and independent grain cleaning outfit, which was moved from one threshing machine to another as desired.

In addition to cleaning grain at the thresher, the portable cleaner can be moved on its truck from farm to farm and used at any time of the year for cleaning seed grain or for cleaning market grain on farms which did not have recleaners operating with the threshing machines.

Disc Principle of Separation

Of the weed seeds found in threshed wheat and rye, those seeds which are either smaller or larger in diameter than the wheat or rye kernels can be removed readily by the use of screens or sieves. But such foreign seeds as wild oats, barley, wild peas and corn cockle, which have about the same diameter as the wheat kernels, pass through the screen or sieve openings along with the wheat or rye. However, wild oats and barley are longer than wheat or rye, while cockle and wild peas are shorter than wheat or rye, and these seeds can therefore be efficiently removed by the disc cleaner.

In cleaning grain with the disc recleaner, mechanical methods are used to make separations of materials according to their length. The disc cleaners will therefore separate from wheat and rye not only the weed seeds which are smaller than wheat and readily separable by sieves but also such other foreign seeds as wild oats and cockle which are longer than wheat, and will do this without appreciable loss of wheat in the screenings.

Description

The portable disc recleaner used in the 1923 grain-cleaning experiments contained thirty-one discs, each approximately twenty-five inches in diameter.

The recleaner had a capacity of 175 to 200 bushels per hour of threshed Hard Red Spring wheat, and a capacity of 135 to 160 bushels per hour of threshed rye and large Durum wheat.

Of the thirty-one discs used, the first fifteen had small pockets for removing the small weed seeds, and the other sixteen discs had larger pockets for removing the wheat and rye from the wild oats and other coarse material.

The second sixteen discs have similar pockets of larger dimensions which remove the wheat and the rye kernels from the wild oats, barley and other coarse material.

The third, fourth and fifth wheat disc remove the cleanest and heaviest wheat and, if desired, this wheat can be taken off and saved for seed wheat through a sacking spout on the front side of the cleaner.

The wild oats and other coarse material which are longer than wheat are not removed by any of the discs. This coarse material flows through an opening in the end of the casing into a spout at the tail end of the cleaner, which leads it into the left leg of the double elevator and is elevated into a second wagon or into sacks.

Results

The portable disc recleaner was operated during 1923 in connection with various threshing machines located in South Dakota, Minnesota and North Dakota. The recleaner was moved to various districts in these three states so that all kinds of conditions, types of threshing machines, and varieties and amounts of weed seeds would be encountered.

Records were kept of all the wheat and rye that was threshed and cleaned at the various locations. Seventeen lots of grain comprising 6,205 bushels of Hard Red Spring, 1,150 bushels of Amber Durum, 600 bushels of Red Durum, and 5,000 bushels of mixed wheat, and 2,800 bushels of rye were cleaned with the portable disc recleaner as part of the threshing operation.

Effect on Dockage.—Fourteen lots of wheat containing from 3 per cent to 15 per cent of dockage were cleaned. One of the lots containing 15 per cent dockage was Durum wheat and was threshed at the rate of slightly over 200 bushels per hour. This was the only lot of grain that was not entirely cleaned to a dockage-free basis. This lot after cleaning contained only one per cent of dockage, which was principally foxtail. A slight change which was later made in the recleaner would undoubtedly have removed the remaining assessable dockage. The other lots of wheat were each cleaned to a dockage-free basis. The three lots of rye containing from 7 per cent to 24 per cent dockage were all cleaned to a dockage-free basis.

Effect on Foreign Matter Other than Dockage.—The portable disc recleaner, in addition to removing the dockage, cleaned out principally all of the cockle, wild rose and wild peas which function as "foreign matter other than dockage" in the inspection and grading of grain. Such weed seeds are generally referred to as inseparables, and when present in sufficient amounts, lower the grade of the wheat in which they appear. In nine of the fourteen lots of wheat cleaned, the grade of the wheat was raised because most of the "foreign material other than dockage" was removed in the cleaning operation. In one lot the grade was raised two grades or from grade number 4 to grade number 2 on this factor alone.

Effect on Test Weight.—The "test weight" is the principal grading factor in determining the numerical grade of wheat. The wheat after passing through the portable disc recleaner was higher in test weight in every instance than the same wheat before it was put into the recleaner, although the test weights in each case were determined on the wheat after removal of dockage by the dockage tester in accordance with the Federal grading rules. An average increase in test weight of 1·0 pound was secured on the wheat, and an average increase in test weight of 0·7 pound was gained on the rye as a result of cleaning. This increase in test weight was sufficient to raise the grade on eight of the fourteen lots of wheat and to raise the grade on one of the lots of rye.

Effect on Storage and Hauling.—The average test weight of the uncleaned threshed wheat in which the test was made before removing the dockage was 52·4 pounds. The average test weight of the cleaned grain was 55·4 pounds, or a higher test by exactly 3 pounds in favour of the cleaned wheat. This fact has important bearing on the storing and hauling of wheat because the 2150·42 cubic inches of space occupied by a measured bushel of wheat should be filled with wheat and not by wheat and dockage.

A lot of wheat containing 15 per cent dockage has a test weight of but 52·4 pounds, and therefore the bushel measure will hold only 44·5 pounds of wheat, the remaining space in the bushel measure being occupied by the dockage. The space occupied by the wheat in this case is slightly less than three-fourths of a bushel by measure. The farmer who has 15 per cent dockage in his wheat is therefore able to haul only three-fourths of a normal load of wheat because one-fourth of the wagon box space is occupied by dockage, whereas if he were marketing clean wheat, his wheat-hauling capacity per load or per day would be increased one-third.

Amount of Grain in Screenings

The amount of grain lost in the screenings removed is one of the real indicators of the efficiency of any cleaner. The elevator operator who buys uncleaned wheat and then cleans it ordinarily loses in the screenings about one per cent of the net wheat. The efficiency of the portable disc recleaner is such that only $\frac{4}{10}$'s of one per cent of the wheat was lost in the screenings.

Gains by Using Recleaner

Samples of all the lots of grain were secured from the stream of uncleaned grain coming from the thresher to the cleaner, and from the stream of cleaned grain leaving the cleaner. After the threshing season, the thirty-four samples of the cleaned and uncleaned wheat and cleaned and uncleaned rye were submitted to several mill and elevator buyers for bids, and the bids on each sample averaged.

Gain in Price Per Bushel.—An average increase in price of $2\frac{1}{2}$ cents per bushel was offered for the cleaned over the uncleaned samples in the case of the Hard Red Spring wheat, an average premium of 3 cents per bushel was bid for the cleaned Amber Durum; no premium was bid for the cleaned Red Durum because the grade remained the same and also one per cent dockage remained in the cleaned sample; an average premium of $4\frac{1}{2}$ cents was bid for the cleaned mixed wheat, one lot of which had been raised two grades by cleaning; and for the cleaned rye a premium of $\frac{1}{2}$ cent per bushel was bid on one lot, no premium being bid for the other two lots.

Saving in Freight—While the average dockage on the grain before cleaning was slightly below the average for the sections where this wheat was grown, the saving in freight alone by shipping the cleaned wheat amounted to 1·2 cents per bushel. All the wheat shipped had a freight rate of 12 cents per bushel or less. Many farmers in the spring wheat states have freight rates higher than 12 cents per bushel and would therefore gain even more per bushel by cleaning their grain before shipment.

Farm Value of Screenings—The screenings were assigned a farm value of $10 per ton, although mill oats were worth $17 a ton and fine seed screenings were worth $14 a ton in Minneapolis at the time.

Net Gain Secured By Farmers—The saving as a result of the cleaning with the portable disc recleaner was at least 7·3 cents per bushel, and allowing 2 cents a bushel for the cost of cleaning, the net gain received by the farmers was 5·3 cents per bushel.

Foot Note 1.—Of the other types of cleaners used in the experiments the "deck cylinder type" may be found to be efficient and practical after several structural changes are made in its design. The Bates aspirator and the fanning mill type of thresher recleaners are entirely practical in the Pacific Northwest but are not recommended for use in the spring wheat area.

TREE PLANTING AS AN AID TO AGRICULTURAL DEVELOPMENT ON THE PRAIRIES

By C. A. EDWARDS, Dominion Forestry Branch

SEVENTY million seedlings and cuttings is a large planting order, but it represents actually the extent to which the demands from prairie farmers for trees have been met by the Dominion Government Forestry Branch in the past twenty years. It proves the fact that trees are just as indispensable to the congenial life of farming communities as they are to dwellers in our western towns and cities, where trees planted along the streets and boulevards and in well designed parks, spread shade and shadow over green lawns and flower beds in front of many fine public buildings and residences.

Although many prairie farms are still bare of trees, it does not follow that they must for ever remain so. On the contrary, there is probably nothing that will give more satisfaction at a smaller cost in time and money than well established belts of trees protecting the fields, gardens and farm buildings.

Much has been written concerning prairie tree planting, and many valuable suggestions have been given by men whose efforts in making their prairie surroundings more congenial have met met success, so that a strong demand persists for trees to improve and beautify this western country, both in civic and rural communities.

Nor have efforts so far been in vain. Through a close supervision of prairie plantings, sufficient information is available to give a fairly accurate idea of the progress being made, and the many benefits derived by those farmers who are giving a little time to the improvement of their holdings by the addition of well disposed tree belts and field shelters. When we speak of growing, distributing, and planting millions of trees, we are interested chiefly in the results obtained and the value of such plantings to the country generally. First, we must remember there are certain factors under our prairie conditions on which the successful and healthy growth of trees depend. It is not enough, under such varying conditions of climate in the West, with one territory more favoured than another, to simply plant the young seedlings and leave them to live or die as the natural elements see fit. Certain cultural methods are known to be absolutely essential if success would be achieved; and where such methods are followed there is no difficulty in establishing tree growth anywhere in the prairie provinces. Several thousand planting reports each year furnish a fairly accurate census of the results of farm shelter belt planting, and may be considered typical of the tree planting situation as a whole. These reports indicate that 75 per cent of the trees in belts now established, are, from the point of their

Typical prairie country and small settlement, in contrast with a well treed farm home. The trees show six seasons' growth.

Seven year old trees planted for field protection at Altario, Alberta. Fruit trees and small fruits are now being grown between the protecting belts.

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cultivation, ground cover, and general appearance, in good healthy condition; serving the dual purposes of shelter and protection, besides the added comfort of pleasant surroundings. The other 25 per cent are divided between a fair and neglected condition. This does not imply that these trees are all a failure, because many would doubtless respond readily to the human touch in the matter of cultivation and attention. New plantings, that is, the distributed planting material of nearly five million seedlings and cuttings set out in the present year, average between 85 and 95 per cent living. In the past twenty years much information and better knowledge concerning the suitability and growth of trees on the prairie has become available, so that it is safe to predict a continued strong movement in western planting, which is already having a marked effect on the attractiveness and character of the country generally.

As an aid to agricultural development, trees have more than a money value. They are of national importance allied with agriculture in the West, and a potent factor in attracting, and what is of greater importance, holding settlers, for there are few people to-day who fail in some measure to enjoy and appreciate the comforts that trees bring to their daily life and surroundings. Apart from this aspect, there is a strong feeling that exclusive grain growing must gradually give place to a more diversified system of farming, and tree planting is one of the big factors in permanent farming activities in Western Canada, and will assist in bringing about a more settled and better agriculture.

RUST OF WHEAT

SO long ago as 1907, Professor Biffin discovered that resistance to Stripe Rust (Puccinia glumarum) is a character which, like many others possessed by plants and animals, is handed on from parent to offspring. He showed, moreover, that resistance to this rust fungus reappears in the second generation of a cross between a resistant and a susceptible variety of wheat. Yet in spite of this discovery epidemics of rust still afflict the wheat crops of the world, reducing yields by so much as fifty per cent. Thus in Minnesota during the ten-year period 1911-1920, rust was epidemic in three years, 1916, 1919 and 1920. In the years when rust was not epidemic the average yield of spring wheat was 15·4 bushels per acre; in the rust-epidemic years it was only 8·6 bushels per acre, truly a case, so far as farming profits are concerned, of the lean kine devouring the fat kine. An impatient person, knowing but little of rusts or research, might conclude in view of these facts that all the labours of science in relation to the suppression of rust have been in vain. Such a conclusion is singularly ill founded. In order to show how erroneous it is, a brief account is given of recent progress* on the experimental investigations of rust and rust resistance. The problem of preventing attack by rust is a complex one, for there are several different species of rust fungus parasitic on wheat. There is the Stripe Rust fungus, Puccinia glumarum, which is that investigated by Professor Biffin in the researches already referred to; there is the Crown Rust, Puccinia coron-

*"Wheat Stem Rust from the Standpoint of Plant Breeding." By H. K. Hayes and E. C. Stakman. Minnesota Experiment Station. No. 300. Journal Series.

arum, and the Black Stem Rust, P. graminis, which though responsible for less damage to wheat in this country (Great Britain) than is caused by certain other rusts, works havoc, as has been shown in crops of spring wheat in Minnesota. Each of these parasitic species does evil after its kind, and the power, unfortunately, of resistance to attack by one species does not mean power of resistance to all. Hence the plant breeder who desires to endow the world with rust-resistant varieties of wheat must be content to deal with one rust at a time. Along these lines good progress has been made and it is well known that hybrid varieties of wheat have been produced at Cambridge by Professor Biffin which combined resistance to Puccinia glumarum—Stripe Rust—with other desirable qualities. These resistant varieties retain their resistance generation after generation. But in the case of other rusts, P. graminis, for example, it appears from the researches of Messrs. Hayes and Stakman (*loc. cit*) and other investigations that the problem of resistance is not so simple. The reasons why the solution is proving more difficult are two: the versatility of the rust species and the sterility of potentially resistant hybrids. Puccinia graminis, among the recognized multitude of fungi known to bring about disease in plants, was one of the first to be discovered. So long ago as the seventeenth century, relation was discovered between the presence of the Barberry and the prevalence of the pest, and laws were passed both in France and North America requiring the extirpation of the common Barberry from the neighbourhood of cornland—laws which it is to be feared were more honoured in the breach than in the observance. In any case, Puccinia graminis, which is now known to belong to that class of organism to which a change is essential still flourishes. It spends the spring of each year in the Barberry, goes away for the summer to the Wheat field, does nothing in the winter and resumes its Barberry existence in the following spring. Whether it is due to the stimulating effect of change of habitat or to some other cause is not known, but the fact is certain that Puccinia graminis is a species composed of numerous races and that these different biological races may be distinguished from one another if not by size, or shape, or colour, yet by their power of attacking the Wheat plant. It is as though some were more savage than others—able to enter and maintain themselves in the tissues of a given variety of wheat, whereas a less savage race of the rust might not enter alive. This being the case the problem of breeding varieties of wheat which shall possess powers of resistance to P. graminis becomes at once clearer and more complex. Restated, it means the breeding of wheat varieties resistant to all—including the most "savage" —biological races of Black Stem rust known to occur in the country in which the wheat is to be grown. To do this, however, means that the different biological races have to be discovered and their powers of infecting wheat of the varieties to be used for cross breeding have then to be ascertained. The magnitude of this task on which Messrs. Hayes and Stakman are engaged may be judged from the fact that the number of biologic races of P. graminis is very large—in Minnesota upwards of thirty-six races have been isolated. Fortunately, the races although numerous, appear to be stable. Their appetite does not, as was once believed, grow by what it feeds on; in other words, a race does not apparently work itself up into a state of greater virulence by living on a variety of wheat which falls an easy victim to it. Each race appears to retain a fixed power of infection so

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that it may be investigated, ticketed and put away for further experimental use. Once a set of the biological races has been obtained and their relative powers of infecting a variety of wheat ascertained, it is, of course easy to ascertain, e.g., by cultivating a few seedling wheat plants in a greenhouse, the degree of resistance of other varieties (and species) of wheat. This the authors have done in the case of several varieties of common wheat. It is a relief to find from the result of their experiments that varieties exist (of winter wheat) which are absolutely immune to nearly all the biological races of P. graminis; such a variety is Kanrid, used for breeding purposes. This variety was crossed with Marquis—which is a susceptible spring wheat. In the third generation varieties were obtained which combined the "earliness" of Marquis with the resistance of Kanrid. Investigations carried out by inoculating seedlings with spores of the different biological races of P. graminis show that varieties belonging to certain types of wheat, e.g., Triticum durum and T. Dicoccum, also possess great powers of resistance to the rust, but the difficulty of making use of this desirable quality is rendered very great by reason of the high degree of sterility which exists in the hybrids between these types of wheat and those of common wheat. Nevertheless, in spite of the complexity of the problem, such good progress is being made towards its final solution that the more sanguine, at all events, may hope that there may come a time even in this world when moth and rust shall not prevail.—*The Gardeners' Chronicle.* November 3, 1923, p. 255.

CANADIAN HORTICULTURAL COUNCIL

REGULATIONS governing the establishment of official trial gardens or plots and demonstration gardens have been agreed upon by the directors of the Canadian Horticultural Council. The trial gardens will be established at government institutions only, such as experimental farms and agricultural colleges, and are for the purpose of testing the merits of new varieties of fruits and flowers originated in Canada with a view to registration. The demonstration gardens may be carried on by horticultural societies and similar organizations with the object of making known to gardeners and the public generally the qualities and characteristics of different varieties and strains of plants now in commerce. Already applications have been received for demonstration gardens for the iris at London and Brampton, the peony at Galt, the gladiolus at St. Thomas, the rose at Markham, and the dahlia at Mimico, in the province of Ontario.

Trial Gardens

The institutions selected for the establishment of official trial gardens, are the following:—

British Columbia.—University of British Columbia, Vancouver; Dominion Experimental Farm, Summerland.

Saskatchewan.—University of Saskatchewan, Saskatoon; Dominion Experimental Farm, Indian Head.

Alberta.—Dominion Experimental Farm, Lethbridge; University of Alberta, Edmonton.

Manitoba.—Manitoba Agricultural College, Winnipeg; Dominion Experimental Farm, Morden.

Ontario.—Ontario Agricultural College, Guelph; Ontario Experiment Station, Vineland; Central Experimental Farm, Ottawa.

Quebec.—Macdonald College, Ste. Anne de Bellevue; Dominion Experimental Farm, Lennoxville.

New Brunswick.—Dominion Experimental Farm, Fredericton.

Nova Scotia.—Dominion Experimental Farm, Kentville.

Prince Edward Island.—Dominion Experimental Farm, Charlottetown.

Demonstration Gardens

The rules and Regulations adopted by the Council with reference to Demonstration Gardens contain the following provisions, namely:—

1. The Applicant shall provide:
   - (*a*) A site satisfactory for the purpose;
   - (*b*) Experienced gardener or gardeners to assure grounds being kept in proper condition;
   - (*c*) Every possible precaution to prevent injury or theft;
   - (*d*) To the Council, entry forms for each variety, properly completed by the donor;
   - (*e*) Records on forms provided by the Council;
   - (*f*) All funds for expenses entailed;
   - (*g*) Assurance that no advertising will be permitted on the grounds;
   - (*h*) Assurance that the gardens will not be commercialized in any manner;
   - (*i*) A Demonstration Garden Committee, the names of which shall be filed with the Council.
2. The Canadian Horticultural Council shall:
   - (*a*) Give full recognition and publicity to the recognized Demonstration Gardens and treat records and information obtained therefrom as authentic;
   - (*b*) Provide judges as required to score and classify the varieties;
   - (*c*) Provide at cost, standardized, permanent labels, indicating variety and name and address of donor.

Rules

(1) No new variety shall be accepted until it has been recorded by the Council. A new variety is one the name of which had not been accepted by a recognized society prior to May 1, 1923.

(2) Entries shall be made direct with the Secretary of the Demonstration Gardens.

(3) All flowers shall be rated according to the Council score card for the kind.

(4) All material will be returned at the end of the demonstration period, if desired, at owner's risk.

Fruits of Canadian Origin Recorded

The Canadian Horticultural Council has decided to officially record a number of varieties of fruits that had their origin in Canada and are well established commercial varieties. They are as follows: The McIntosh and Fameuse apples; the Fitzgerald peach; the Windsor cherry; the Herbert raspberry; the Hilborn black raspberry; the Josselyn gooseberry, and the Saunders black currant.

List of Recorded Varieties

Class of plant	Name	Origin and description	Originator	Address
Black Raspberry	Hilborn	Originated by W. W. Hilborn, Arkona, Ont. Fruit medium to large, black, glossy, with a little bloom; firm, juice, sweet, good flavour; quality very good; season medium. Plant vigorous, hardy, productive. One of the hardiest and best varieties.	W. W. Hilborn	Arkona, Ont.
Gooseberry	Josselyn	Originated about 1870; named Red Jacket, but, as there was already an English variety under this name, it was renamed Josselyn by Geo. S. Josselyn, Fredonia, N.Y. A cross between Houghton and Red Warrington. Fruit larger than Downing, roundish to oval, green, more or less covered with coppery red; smooth; subacid; sprightly; good flavour; good quality; season medium	Dr. Wm. Saunders (deceased).	Experimental Farm, London, Ont.
Raspberry	Herbert	Originated as a chance seedling in 1887. Thought to be a seedling of Clarke. Fruit large to very large, obtusely conical, bright to rather deep red, moderately firm, sweet and subacid, sprightly, good flavour. Quality very good; season medium.	R. B. Whyte	Ottawa, Ont.
Apple	McIntosh Red	Originated as a chance seedling in 1796. Propagation begun in nursery by Allan McIntosh, Dundela, Ont., about 1870. Fruit above medium size, roundish, yellow almost or quite covered with crimson, subacid, sprightly, aromatic. Quality very good. Season November to February or later.	John McIntosh	Matilda Tp., Dundas Co., Ont.
Black Currant	Saunders	Originated about 1870. A seedling of Black Naples Seedling. Fruit above medium to large. Skin thick; briskly subacid; quality medium; season medium. A strong grower and very productive. One of the best commercial varieties.	Late Dr. Wm. Saunders.	London, Ont.
Peach	Fitzgerald	Originated in the garden of Mr. Fitzgerald about 1895. Fruit medium to large; form roundish ovate; colour bright yellow covered with deep red; freestone; flesh yellow, red at pit; texture tender and juice; flavour good; quality good; season early to mid-September. Hardier than some others.	Mr. Fitzgerald	Oakville, Ont.
Cherry	Windsor	Originated on the farm of Jas. Dougall, Windsor, Ont. First exhibited by the originator at the summer meeting of the Fruit Growers' Association of Ontario in 1871. A sweet cherry of the Bigarreau type. Fruit dark red; turning almost black; oblong to conical; compressed, of large size, firm flesh, sweet and of good quality. Season medium to late.	Jas. Dougall	Windsor, Ont.
Apple	Fameuse	Origin obscure but it is generally believed that seed was brought from France by the early settlers of Canada and from this seed originated the Fameuse known also as Snow and Chimney apple. Fruit medium size, roundish, yellow almost or completely covered with deep red or striped with red. Flesh white, very tender, subacid, with a fine flavour. Quality very good. Season October to February.		

Recorded New Varieties

On the recommendation of the Plant Registration Committee the following new varieties of plants of Canadian origin have been accepted for recording. They will be subjected to official test in the Trial Gardens provided for the purpose and will afterwards, if satisfactory, be granted registration.

List of Recorded Varieties (New)

Class of plant	Name	Origin and description	Originator	Address
Rose	Agnes	Cross between Rosa Rugosa (f.) and Persian Yellow (m.); habit, texture and colour of leaves resemble Rosa R. Flower double, pale amber, fragrant, blooms early but only once in a season. Form of bud good. Quite hardy at Ottawa.	Late William Saunders.	Experimental Farm, Ottawa.
Gladiolus	Sarah Wood	Large bright red flower, silvered inside; straight stem; vigorous.	Miss Nellie M. Stockford.	Guelph, Ont.
Gladiolus	Lauretta Peer	Seedling, parentage unknown. Light purple, deep purple way back in throat, mid vein on petals lighter. About 15 flowers to a spike, closely arranged.	J. Wesley Peer	Lorne Park, Ont.
Gladiolus	John Wesley	Seedling, parentage unknown. Three cornered petals, salmon pink, suffused with deep red inside, mid-vein light. Flowers large, about 5½ inches across, 16 to 17 being borne on vigorous spike.	J. Wesley Peer	Lorne Park, Ont.
Gladiolus	Lady Byng	Cross between Primulinus and America, seedling. Pure shell pink flowers, delicately tinged with lemon yellow. Flowers 4½″ to 5½″ in size, about 12 to spike.	Archibald Gilchrist	Islington, Ont.
Strawberry	Scugog	Cross between Rango (a seedling raised by Mr. Crawford) and Bubach. Heavy cropper, good colour, very little core, solid centre, flavour fair.	Charles Byron Crawford.	Cooksville, Ont.
Chrysanthemum	Lady Byng	White Mensa crossed H. Marie Tetty, originated in the Horticultural Division, Ottawa, 1921. Single pink with white centre, petals somewhat twisted or cactus-like, good stem.	Horticultural Division.	Experimental Farm, Ottawa.
Chrysanthemum	J. R. Booth	A sport of Nag-ir-roc and same shape. An exhibition variety double, reflexed, lemon yellow in colour; flowers 9″ across and about 7″ deep.	Horticultural Division, 1919.	Experimental Farm, Ottawa.

The Plant Registration Bureau is maintained at the headquarters of the Canadian Horticultural Council at Ottawa, under the supervision of L. F. Burrows, secretary of the Council.

ACCREDITED HERD REGISTER

Supplementary List

DURING the months of November and December, 1923, fully accredited herd certificates were issued to the following:

PRINCE EDWARD ISLAND

AYRSHIRE

Prowse, Mrs. E. A., Winslow Station.

HOLSTEIN-FRIESIAN

Callbeck, Howard, North Tryon.
McNutt, J. Wallace, Darnley.

SHORTHORN

Simpson, John, Hamilton.

NEW BRUNSWICK

AYRSHIRE

Dickson, H. V., Hammond River.

HOLSTEIN-FRIESIAN

Stockton, R. A., Sussex.

QUEBEC

AYRSHIRE

Arthur, Robt. A., Huntingdon.
Bazinet, J. L., St. Paul de Joliette.
Bruce, A. A., Huntingdon.
Crittenden, A., West Brome.
Edwards, B. A., Lacolle Junction.
Hawkins, W. J., Hemingford.
Mousseau, J. B., Berthierville.
McGrandel, W., Arundel.
Nadeau, Desire, St. Paul.
Perreault, Camille, Joliette.
Pettes, Mrs. J. M. & Son, West Brome.
Stark, Andrew, Huntingdon.
Stark, T. B., Huntingdon.
Tourigny, John, Bécancour.
Wadey, C. A., Abercorn.

CANADIAN

Cayouette, J. L., Bromptonville.
Bazinet, J. L., St. Paul de Joliette.

HOLSTEIN-FRIESIAN

Deland, Henri, L'Acadie.
Frost, E. I., Ayer's Cliff.
Healy, W. H. & Son, Richmond.
Hillhouse, A. P., Foster.
Jackson, Woodward, Franklin Centre.
Pope, A. L., Coaticook.
Vaughan, E. L., Compton Station.

JERSEY

Burton, Edward, Lennoxville.
Emerson, W. H., Sutton Junction.
Healy, Ernest E., Richmond.
Healy, W. H. & Son, Richmond.
Hunting, W. H. & Son, Lennoxville.
McCullagh, C. W., Tomifobia.
Pope, A. L., Coaticook.
Sheperd, C. W., Knowlton.

SHORTHORN

Pickel, T. P., Cowansville.
Woodward, J. R., Lennoxville.

ONTARIO

AYRSHIRE

Hudson, J. & Son, Lyn.
McVicar Bros., Belmont.
Roberts, H. L., Simcoe.
Turner, E. A., St. Pauls.

GUERNSEY

Roselawn Farm, Roche's Point.

HOLSTEIN-FRIESIAN

Atkins, F. L., Putnam.
Bilton, J., Hagersville.
Campbell, J. R., Stouffville.
Cherry, W. H., Hagersville.
Couch, Norman W., Smiths Falls.
Cumming, Dougall, Russell.
Durham, G. W., St. George.
Everett, L. A., Simcoe.
Fich, Peter B., Point Rowan.
Foran, T. W., St. George.
Gill, Gleason, Russeldale.
Hartley, Stephen, Woodstock.
Hubbs, Fred H., Bloomfield.
Kaufman, J. C., Bright.
Leslie, G. P., Oakville.
MacDonald, Hubert, Bloomfield.
McIntosh, John E., Vankleek Hill.
McKay, D. J., Science Hill.
Mason, Mrs. W. E., Simcoe.
Moerschfelder, L. C., Selkirk.
Moore, J. J., Waterford.
Moyer, Harvey W., Markham.
Park, A. C., Listowel.
Patten, W., St. George.
Robb, G. B., Branchton.

Smith, A. R., Waterford.
Starling, Edward, St. Williams.
Thistle, Harold, St. Pauls.
Tierney, Herman J., Metcalfe.
Tufford, R. E., Norwich.
Turner, J. E., Carlingford.
Wilson, J. Harlow, Hamilton.

JERSEY

Arnott, H. H., Brampton.
Colton, H., Malton.
Latsch, Geo. W., Kitchener.

SHORTHORN

Gowan, E. W., Jarvis.

MANITOBA

ABERDEEN-ANGUS

Patterson, Thos., Rosebank.

HEREFORD

Brigham, Richard, Deleau.
Garland, W. P., Carberry.
Robinson, H. E., Carman.

HOLSTEIN-FRIESIAN

Wilton, T. J., Roland.

SHORTHORN

Evans, P. D., Killarney.
Forder, W., Pipestone.
Grant, W. L., Lenore.
Kahler, C. & Son, Moline.
Laycock, Thos., Rosebank.
Lelond, W., Sr., Miniota.
Paterson, D., Berton.
Sinclair, G. W., Elkhorn.
Sinclair, W. H. C., Swan River.

SASKATCHEWAN

SHORTHORN

James, E. A., Semans.
Watson, W. P., Dalesboro.

ALBERTA

AYRSHIRE

Standish, Jos., Calgary.

HOLSTEIN-FRIESIAN

Burns, J. W. C., Spruce Grove.

SHORTHORN

Shuttleworth Bros., Beddington.

BRITISH COLUMBIA

GUERNSEY

Bazette, W., Duncan.
Chorlton, P., New Westminster.

HOLSTEIN-FRIESIAN

Brown, H. W., Cloverdale.
Chorlton, J., New Westminster.
Lloyd, F. & Gainsford, J., Westholme.

JERSEY

Lloyd, F. & Gainsford, J., Westholme.

CERTIFICATES CANCELLED

The following certificates have been cancelled:

ONTARIO

Fargo, Wm., Ayrshire.
McRae, Geo. A., Holstein.
Phillips, J. J., Holstein and Grades.
Roy, D., Ayrshire and Grades.
Slack, A. C., Holstein.
Stevens, W. C., Holstein.

QUEBEC

Fowler, H. W. & O. A., French Canadian.
Taylor, B. J., Ayrshire.

MANITOBA

Leader, Harry, Aberdeen-Angus and Grades.
Parish, W. L., Aberdeen-Angus.
Stewart, D., Shorthorn.

BRITISH COLUMBIA

Bevan, W. H., Jersey.

ANNUAL REPORT ON FIELD CROPS OF CANADA, 1923

THE Dominion Bureau of Statistics has issued the final report on the area, yield, quality and value of the field crops of Canada for the year 1923. The total area under field crops in 1923 was 56,569,794 acres as against 57,189,681 acres in 1922. The aggregate value of all field crops in 1923 is $891,755,200, as compared with $962,293,200 in 1922, a decrease of $70,538,000, caused mainly by lower prices applicable almost to every crop. The hay and clover crop alone however accounts for a decrease of $32,068,000, the average price per ton having fallen from $13.46 to $10.97.

Areas and Yields of Grain Crops

The total yield of wheat in Canada for the year 1923 is finally estimated at 474,199,000 bushels from an area of 22,671,864 acres, as compared with 399,786,400 bushels from 22,422,693 acres in 1922 and with 269,233,910 bushels from 20,079,832 acres, the annual averages for the five years 1918-22. The total for 1923 consists of 19,315,000 bushels from 815,706 harvested acres of fall wheat and of 454,884,000 bushels from 21,856,158 sown acres of spring wheat. The total wheat crop of 474,199,000 bushels as now finally estimated is the largest on record for Canada, and compares with 399,786,400 bushels, last year's record crop, and with 393,542,600 bushels, the previous record crop of 1915. The average yield per acre for all wheat in 1923 is 21 bushels, as compared with 17¾ bushels in 1922, and with 13½ bushels, the five-year average (1918-22), and with 26 bushels, the record for 1915. For fall wheat the average yield per acre in 1923 is 23¾ bushels against 21¼ bushels in 1922 and 22¼ bushels, the five-year average. For spring wheat the average for 1923 is 20¾ bushels, as compared with 17¾ bushels in 1922 and with 13 bushels, the five-year average. Oats yielded in 1923 the total of 537,733,300 bushels from 13,727,067 acres, as compared with 491,239,000 bushels from 14,541,229 acres in 1922, and with 453,776,220 bushels from 15,416,527 acres, the five-year average. The total for 1923 is the highest on record, the previous record being 530,709,700 bushels in 1920. The average yield per acre is 39¼ bushels, as against 33¾ bushels in 1922 and 29½ bushels, the five-year average. Barley yielded the total of 76,997,800 bushels from 2,784,571 acres, as compared with 71,865,300 bushels from 2,599,520 acres in 1922 and with 65,712,318 bushels from 2,749,165 acres, the five-year average. The average yields per acre were 27¾ bushels in 1923, 27¾ bushels in 1922, and 24 bushels, the five-year average. Flaxseed yielded in 1923 7,139,500 bushels from 629,938 acres, as compared with 5,008,500 bushels from 565,479 acres in 1922 and with 5,729,200 bushels from 937,605 acres, the five-year average. The yield per acre was 11·30 bushels in 1923 as against 8·85 bushels in 1922 and 6·10 bushels, the five-year average. For the remaining cereal crops the total yields for 1923 were in bushels as follows, the corresponding totals for 1922 and for the five-year average being shown within brackets: Rye 23,231,800 (32,373,400; 16,769,372); peas 2,898,200 (3,170,100; 3,437,576); beans 1,041,700 (1,303,300; 1,722,096); buckwheat 9,743,700 (9,701,200; 9,770,460); mixed grains 29,750,500 (27,707,700; 29,182,780); and corn for husking 13,608,000 (13,798,000; 14,836,500).

Root and Fodder Crops

The total yield of potatoes in 1923 was 56,460,000 cwt. from 560,942 acres, as compared with 55,745,300 cwt. from 683,594 acres in 1922 and with 67,680,880 cwt. from 744,801

acres, the five-year average. The average yield per acre in 1923 is 100½ cwt., as compared with 81·55 cwt. in 1922 and with 90¾ cwt., the five-year average. Turnips, mangolds, etc., gave a total of 38,211,600 cwt. from 194,512 acres in 1923, as against 43,-973,500 cwt. from 224,256 acres in 1922 and 51,847,640 bushels from 276,910 acres, the five-year average. The yield per acre is 196½ cwt., as compared with 196·10 cwt. in 1922 and with 187¼ cwt., the five-year average. Sugar beets produced 216,-200 tons in 1923 from 22,450 acres, as against 190,400 tons from 20,725 acres in 1922 and 258,160 tons from 25,576 acres, the five year average. The yield per acre was 9·60 tons in 1923, 9·20 tons in 1922 and 10·10 tons the average. Of hay and clover the total yield was in 1923, 14,844,900 tons from 9,725,602 acres, as compared with 14,488,200 tons from 10,-001,667 acres in 1922, and with 14,-062,660 tons from 10,427,182 acres, the average. The yields per acre were 1·55 ton in 1923, 1·45 ton in 1922 and 1·35 ton, the average. Grain hay yielded 4,336,100 tons from 1,920,432 acres, an average yield per acre of 2¼ tons. Of alfalfa the total yield in 1923 was 1,028,600 tons from 391,-116 acres, as compared with 806,400 tons from 305,933 acres in 1922, and with 598,598 tons from 246,336 acres, the average. The yield per acre was 2·65 tons in 1923, 2·65 tons in 1922, and 2·45 tons, the average for the five years. Fodder corn yielded 5,320,800 tons from 659,070 acres in 1923, as against 5,879,000 tons from 654,624 acres in 1922 and 5,522,522 tons from 568,567 acres, the five-year average. The yield per acre was 8·10 tons in 1923, 9 tons in 1922 and 9·70 tons, the average for the five years.

Grain Yields of the Prairie Provinces

The total grain yields in the three Prairie Provinces (Manitoba, Saskatchewan and Alberta) are finally estimated as follows: Wheat, 452,260,-000 bushels from 21,665,276 acres (375,194,000 bushels, 21,223,448 acres in 1922); oats 365,491,800 bushels from 8,372,081 acres (289,660,000 bushels, 8,564,212 acres in 1922); barley 59,778,200 bushels from 2,180,472 acres (53,612,000 bushels, 1,983,292 acres in 1922); rye 20,842,000 bushels from 1,303,210 acres (29,429,000 bushels, 1,926,117 acres in 1922); flaxseed 7,044,800 bushels from 620,-172 acres (4,901,700 bushels, 555,043 acres in 1922).

Quality of Grain Crops

The average weights in pound per measured bushel for all Canada are as follows, the averages for 1922 and for the five years 1918-22 being given with brackets: Fall wheat 60·23 (59·91; 60·24); spring wheat 58·55 (60·31; 58·94); all wheat 58·80 (60·24; 59·25); oats 35·55 (35·68; 34·81); barley 47·19 (47·66; 46·98) rye 54·61 (55·71; 55·38); peas 60·00 (60·08; 59·90); beans 59·09 (59·39; 59·42); buckwheat 47·80 (47·80; 47·55); mixed grains 44·19 (44·33; 44·36); flaxseed 54·63 (55·04; 54·61); corn for husking 55·29 (55·45; 55·36). The weights of wheat and rye are below both those of 1922 and also of the average; but other grains are about equal to the average.

Values of Field Crops

The average prices per unit, as received by farmers in 1923, are estimated from the reports of crop correspondents for all Canada as follows, the corresponding prices for 1922 and for the five-year average 1918-22 are given within brackets: Per bushel: Fall wheat 92 cents ($1.01; $1.63); spring wheat 66 cents (84 cents; $1.36); all wheat 67 cents (85 cents; $1.37); oats 33 cents (38; 56); barley 42 cents (46; 79); rye 48 cents (58; 91); peas $1.72 ($1.84; $2.47); beans $2.66 ($2.85; $4.33); buck-

wheat 84 cents (84; $1.24); mixed grains 59 cents (60; 95); flaxseed $1.75 ($1.72; $2.50); corn for husking 92 cents (83; $1.18). Per cwt: Potatoes $1.01 (90 cents; $1.43); turnips, mangolds, etc. 59 cents (54; 79): Per ton: Hay and clover $10.97 ($13.46; $19.78); alfalfa $11.54 ($12.77; $18.76); grain hay $3.47 ($12.88, 1922); sugar beets $6.48 ($7.88; $10.05).

The total values of field crops in 1923 are estimated as follows, the corresponding values for 1922 and for the five-year average 1918-22 being given within brackets: Wheat $316,606,700 ($339,419,000, $369,822,400); oats $177,704,400 ($185,455,000; $252,084,020); barley $32,055,700 ($33,335,300; $52,223,964); rye $11,246,900 ($18,703,200; $15,231,350); peas $4,987,400 ($5,818,200; $8,486,060); beans $2,773,000 ($3,713,800; $7,457,280); buckwheat $8,191,700 ($8,140,800; $12,157,500); mixed grains $17,654,800 ($16,500,700; $27,628,004); flaxseed $12,517,900 ($8,638,900; $14,328,000); corn for husking $12,466,000 ($11,509,700; $17,480,580); potatoes $57,076,800 ($50,320,000; $96,680,080); turnips, mangolds, etc., $22,650,100 ($23,886,000; ($41,185,960); hay and clover $162,882,000 ($194,950,000; $278,174,180); alfalfa $11,872,000 ($10,295,000; $11,231,480); grain hay $15,063,800; fodder corn 24,605,000 ($29,197,600; $36,279,600); sugar beets $1,401,000 ($1,500,000; $2,594,340).

COMMERCIAL FRUIT PRODUCTION OF CANADA

THE following information as to production and value of the commercial fruit crops of Canada is supplied by the Dominion Bureau of Statistics:

PRODUCTION AND VALUES, 1923

Class	Quantity	Value
Apples	4,063,719 barrels	Not yet estimated.
Pears	227,335 bushels	$ 550,587
Plums and prunes	348,482 "	696,964
Peaches	403,660 "	916,050
Apricots	32,850 "	.....
Cherries	203,125 "	722,440
Strawberries	8,652,200 quarts	1,513,230
Raspberries	4,496,840 "	1,044,000
Other berries	2,527,700 "	494,691
Grapes	42,185,077 lbs.	2,742,030

Values, 1921 and 1922

The total estimated value of commercial fruit produced, based on average wholesale market prices, is $45,262,788 for 1921 and $33,899,121 for 1922.

By provinces, the total values in 1922 are as follows:

Ontario	$ 14,295,140
British Columbia	9,181,902
Nova Scotia	7,947,118
Quebec	1,579,368
New Brunswick	895,593

Province		Apples	Pears	Plums and Prunes	Peaches	Apricots
		bbls.	bush.	bush.	bush.	bush.
Ontario	1923	1,304,400	112,000	83,100	332,860	.....
	1922	1,739,000	336,000	167,181	501,764	.....
British Columbia	1923	1,124,933	94,835	265,382	70,800	32,850
	1922	1,027,333	102,727	241,257	75,797	37,766
Nova Scotia	1923	1,500,000	20,500	.....	.....	.....
	1922	1,891,852	22,500	.....	.....	.....
Quebec	1923	65,094	.....	.....	.....	.....
	1922	216,984	.....	.....	.....	.....
New Brunswick	1923	69,292	.....	.....	.....	.....
	1922	173,236	.....	.....	.....	.....

Province		Cherries	Straw-berries	Raspberries	Other Berries	Grapes
		bush.	qts.	qts.	qts.	lbs.
Ontario	1923	103,125	3,607,200	840,000	950,000	42,185,077
	1922	130,000	4,755,000	3,360,000	1,420,000	70,308,462
British Columbia	1923	100,000	3,900,000	3,360,765	1,441,200	.....
	1922	72,740	2,720,000	2,850,320	1,286,176	.....
Nova Scotia	1923	.....	135,000	36,080	112,500	.....
	1922	.....	128,000	33,081	108,273	.....
Quebec	1923	.....	510,000	.....	.....	.....
	1922	.....	403,000	.....	.....	.....
New Brunswick	1923	.....	500,000	16,995	24,000	.....
	1922	.....	672,000	28,324	23,100	.....

NEWS ITEMS AND NOTES

The figures for the total production of milk and its products in 1922 show a decrease in cheese as compared with 1921, but the increase of over 19,000,000 pounds in creamery butter is nearly double the decrease in cheese on a butter fat basis. There was a decrease in condensed milk and an increase in milk powder for 1922.

The total value in 1922 of all dairy products, with the value of dairy butter and milk consumed estimated, amounted to $193,000,000 in round figures, which is somewhat less than in 1921.

"The year 1923 will be looked back upon as a milestone in the progress of Canadian dairying for the reason that systematic grading of all butter and cheese for export was inaugurated in that year. The work has been carried out with less difficulty than was anticipated, and in the light of the past year's experience and with some improvement in the regulations, we have reason to believe," states Commissioner Ruddick, "that in future the grading system will run even more smoothly than it has done so far. It is too early yet to talk much about results, and yet evidence can be produced to prove that there has been decided improvement in the quality of the cheese and butter in a great many cases, and that it was due to the grading is freely admitted by those most concerned."

The British Columbia Poultry Association at its annual Show at Victoria in December, inaugurated an egg-judging competition for children, which is probably the first contest of this kind held in the Dominion. Each competitor was given a dozen eggs to grade by the candling process. This was followed by an examination paper containing a number of questions relating to the work. The children showed much aptitude in distinguishing the several grades, and also wrote creditable examination papers. A similar competition will be conducted at the spring show.

Plans are now made whereby some 30 Illustration Stations in Nova Scotia and New Brunswick will this year propagate registered seed stocks under the supervision of Experimental Farms Branch officials. As an outcome of this project, it is expected that there will be achieved two fundamental objects, viz:

(1) A limited supply of pedigreed seed will be made available for distribution in the provinces concerned;

(2) A number of communities will be given a visual demonstration of the profitableness of sowing pedigreed seed and thus inaugurate seed growing centres.

The report of the Live Stock Commissioner for the province of Saskatchewan has been issued for the twelve months ending April 30, 1923, and covers the various phases of activity of the Branch for that period, as well as accounts of the work carried on by the Saskatchewan Live Stock Associations, the Live Stock Board, and the Western Canada Live Stock Union.

The Saskatchewan Live Stock Exhibit of 1923 made a good record for itself at the larger shows on this continent, and secured much valuable publicity both for individual breeders and for the province. The following were the prizes secured:

	Royal Winter Fair, Toronto	The International, Chicago
Grand Championships	4	1
Senior and Junior Championships	4	1
Canadian Bred Championship		1
Reserve Championships	5	1
Special Trophies	2	1
1st Prizes	23	4
2nd Prizes	9	4
Other Prizes	28	27
Total	75	40

At the Guelph, Ontario, Winter Fair, with a small exhibit, 14 prizes were won for cattle, sheep and horses, making a grand total at all three shows of 129 prizes.

During the month of December, 1923, 1,243 packages of nursery stock, valued at $60,000, and miscellaneous plant products to the value of $280,000, were examined by the Division of Foreign Pests Suppression, Dominion Entomological Branch.

The growing of the filbert nut has been receiving some attention in the province of British Columbia. To protect growers against the possible introduction of the filbert blight from Eastern Canada and from certain States of the American Union where it is found to exist, a regulation has been passed under the Destructive Insect and Pest Act to prohibit the entry into the province of British Columbia of plants or cuttings of all species, hybrids and horticultural varieties of hazel, cob or filbert nuts from Nova Scotia, Prince Edward Island, New Brunswick, Quebec and Ontario.

Peach orchards in the province of British Columbia are free from "peach yellows" disease, which has been responsible for much damage to orchards in the Niagara district of Ontario. To prevent the introduction of the disease into the Pacific Province, the importation into that province of all peach nursery stock, fruit pits or seeds from Eastern Canada and from certain states is prohibited by regulation under The Destructive Insect and Pest Act.

A regulation under the Destructive Insect and Pest Act has been passed by the Dominion Government to prevent the distribution of the White Pine Blister Rust into Western Canada. This disease was first found in America at Geneva, New York State, in 1906, and was not observed in Canada until eight years later. A survey soon discovered its presence on a wide scale in the Niagara Peninsula, and it has since been found in other parts of Ontario. This disease is particularly destructive to the white pine and drastic measures are necessary to keep it within reasonable limits. The regulation referred to prohibits the importation of certain species of pines and of currant and gooseberry plants subject to the disease into Alberta and British Columbia from all parts of the world and from the other provinces of Canada. There is no restriction, however, on the movement of the fruits of either currants or gooseberries.

The farms of Canada—including land, buildings, machinery, livestock, etc.,—constitute the largest item in Canada's national wealth, being valued by the Dominion Bureau of Statistics at $6,592,351,789 in 1921.

The Agricultural Representative for Northumberland county, Ontario, Mr. H. Sirett, reports that the County Council has made an appropriation for the purchase of 1,000 acres of land for the establishment of a reforestation area. The enterprise is to be undertaken in connection with the Department of Forestry of the Provincial Government.

According to Premier Bracken, weeds cost the farmers of Manitoba more than $20,000,000 annually.

At the Ottawa laboratory of the Dominion Seed Branch there is a well-equipped section for micro-analysis. Activities in this section have been directed mainly to the examination of ground feeding stuffs samples that are submitted by inspectors. The suspicion of adulteration of any feeding stuff may be confirmed by this new analytical service, and with most samples it is possible to make a quantitative determination that is reasonably accurate in point of percentage.

The Saskatchewan dairy industry made good progress in 1923, the creamery output for the year showing an increase of almost 20 per cent. One and three-quarter million pounds were shipped direct to British dealers, and all reports received were highly complimentary to the product. The aggregate value of the dairy products of the province in 1922 was $18,698,493.

The feeding of ensilage is one of the most important factors in reducing the cost of winter milk production, says the Saskatchewan Dairy Commissioner. A silo either above or below ground assures an abundance of cheap feed so essential to profits. There were 460 silos in the province in 1923, 167 of which were above ground.

In spite of the rapid development of dairying in Saskatchewan, there are still not more than twenty-five per cent of the farmers of the province who are creamery patrons.

The Saskatchewan Dairy Branch has co-operated with the Visual Instruction Branch of the Bureau of Publications for the Province in the preparation of three special dairy films entitled "Selection of a Dairy Cow," "The Trench Silo," and "Pure Bred Sires."

The Saskatchewan Dairy Association has done much to stimulate cow recording work by means of a competition known as the Greater Average Production Competition, among herd owners keeping production records. The winners are determined by figures recorded monthly in the office of the Dairy Commissioner. The fact that each year the production of the winning herd has been materially greater than the year previous, is evidence of the value of intelligent weeding out of unprofitable cows, as determined by the use of the scale and the Babcock tester.

The boys' and girls' dairy cattle judging competition, which has come to be recognized as one of the most important features of the Saskatchewan Dairy Convention, is this year being held for the seventh successive time.

Among the numerous other competitions arranged for at the convention is one in which prizes are offered for the best judge of ice cream. The competition for ice cream makers held last year will be repeated with a view to establishing a commercial standard.

The following extracts are from the 1923 Report of the Directors of the Dairymen's Association of Western Ontario:

"The dairy farmer is always assured of a cash income and a market for a first grade commodity irrespective of fluctuating or glutted markets for some other farm products.

"In the year 1922 Canada produced 135,821,000 lbs. of cheese and 152,581,000 lbs. of creamery butter; of this amount Ontario produced 92,709,000 lbs. of cheese and 51,613,000 lbs. of creamery butter.

"Increased cheese production during the past season is noted while the output of creamery butter was probably equal to if not greater than that of 1922.

"Payment for milk on a quality basis not only provides an equitable method for the distribution of the proceeds from the sale of milk products but also tends to create a greater interest in cow testing, which if persistently followed, insures improved herds, greater net profits per cow and a lower cost of milk production.

"The adoption of a uniform method for the payment for cream on a graded basis is the great problem before the creamery industry of Ontario. Compulsory cream grading has been accepted in every province with the exception of Ontario, but whether or not such a plan is feasible for this province has yet to be determined. An immediate improvement in quality has been obtained wherever efficient cream grading has been adopted, and there is every evidence available that the payment for cream on a quality basis is a sound foundation upon which to build and insure permanent improvement. Cream grading furnishes the incentive to the producers to care for the cream properly and to deliver it to the creameries sweet. Payment on grade standards, we submit, is of as great importance as the payment by grade for the finished product.

"Quality dairy products must be recognized by both producers and manufacturers as the foundation upon which we must build for the future if we are to maintain and eventually increase the desirable markets for our surplus dairy products. It has been repeatedly pointed out by many authorities that the export trade will readily absorb any surplus of No. 1 grade products but that it will be difficult in future to dispose of at a profit in any market low grade products."

One of the objects of the Dominion Illustration Stations is to serve as a source of production of high class seed and as a centre for its distribution, by sale, to farmers, and particularly to those in the neighbourhood of the Station. The varieties and strains that have proved most productive on the nearest Experimental Farm are grown at the Station, and thus made available to those who wish to secure a supply for seed purposes. The total amount of seed sold from the Illustration Stations in 1923 was as follows:

Seed oats, barley, wheat, potatoes, 18,732 bushels.

Grass and clover seed, 7,125 pounds.

APPOINTMENTS AND STAFF CHANGES

Mr. Geo. H. Barr has resigned his position as Chief of the Dairy Division of the Dominion Dairy and Cold Storage Branch, with which he has been connected for the past seventeen years, to engage in private business. Mr. Barr, who is well known to dairymen throughout the Dominion, did a great deal of useful work on behalf of the dairy industry during his connection with the Dairy Branch; notably in connection with the standardizing of practices in butter and cheese manufacture.

John M. MacCallum, B.S.A., of New Hamburg, Ontario, has been appointed Chief of the Stockyards Service, Dominion Live Stock Branch, to succeed D. Johnston.

F. T. Wahlen, D.Sc., has been promoted from Supervising Analyst to Chief Seed Analyst, Ottawa, succeeding A. Eastham.

Felix Charlan, Dominion Experimental Farms Branch, is resigning his position as Chief Officer of the Tobacco Division, Dominion Experimental Farms Branch, to accept a similar position in Argentina.

ASSOCIATIONS AND SOCIETIES

British Columbia Certified Seed Potato Growers' Association.—President, Geo. Stewart, Keatings, B.C.; Secretary, C. Tice, Department of Agriculture, Victoria, B.C.

Canadian Ayrshire Breeders' Association.—President, J. L. Stansell, Strafford-ville, Ont.; Vice-President, Frank Byrne, Charlesburg, Que.; Secretary, W. F. Stephen, Huntingdon, Que.

Canadian Council of Agriculture.—President, W. A. Amos, M.A., Palmerston, Ont.; Vice-President, Colin H. Burnell, Oakville, Man.; Secretary, J. W. Ward, 307 Bank of Hamilton Building, Winnipeg.

Canadian Florists and Gardeners Association.—President, S. Kirk, Georgetown, Ont.; Vice-President, T. Duggem, Brampton, Ont.; Secretary, H. J. Eddy, 4145 St. Catherine St., Montreal.

Canadian Kennel Club Inc.—President. Jos. Russel, 437 Jarvis Street, Toronto; Vice-President, H. Clayton, 2018 Queen St. E., Toronto; Secretary, Jas. D. Strachan, 34 Hambly Ave., Toronto.

Canadian Seed Growers' Association.—President, G. H. Clark, 114 Vittoria St., Ottawa; Vice-Presidents: Manitoba, T. J. Harrison, Manitoba Agricultural College, Winnipeg; P.E.I., W. H. McGregor, Central Lot 16; Quebec, R. Summerby, Macdonald College, P.Q.; Secretary, P. Stewart, 114 Vittoria St., Ottawa.

Canadian Silver Fox Breeders' Association.—President, J. A. Webster, Charlottetown, P.E.I.; Vice-President, P. G. Clark, Summerside, P.E.I.; Secretary, Jas. H. Prichard, Summerside, P.E.I.

Canadian Society of Technical Agriculturists.—President, H. Barton, Macdonald College, Que.; Vice-Presidents: E. A. Howes, University of Alberta, Edmonton; Jules Simard, Seed Branch, Department of Agriculture, Que.

Dominion Bantam Association.—President, Victor Barber, 890 College St., Toronto; Vice-President, T. J. Riley, 82 Thornton Ave., London, Ont.; Secretary, J. T. Isbell, 39 Woolfrey Ave., Toronto.

Eastern Ontario Poultry Association.—President, W. H. Carleton, 110 Stanley Ave., Ottawa; Vice-President, J. W. McKay, 120 Bayswater Ave., Ottawa; Secretary, B. Phelan, 415 Wellington St., Ottawa.

Gardeners and Florists Association of Ontario.—President, S. McIlroy, 139 Galley Ave., Toronto; Vice-President, T. Smith, 163 Silverthorne Ave., Toronto; Secretary, R. G. Thompson, 26 Alcina Ave., Toronto.

Maritime Poultry and Pet Stock Association.—President, S. E. McKie, 25 Birch St., Moncton, N.B.; Vice-President, Samuel Steeves, Sunny Brae, N.B.; Secretary, A. Vye Gibson, Main St., West Moncton, N.B.

Maritime Stock Breeders' Association.—President, A. E. Trites, Salisbury, N.B.; Vice-Presidents: Nova Scotia, S. A. Logan, Amherst; New Brunswick, G. P. C. McIntyre, St. John; Prince Edward Island, Jas. F. Roper, Charlottetown; Secretary, F. L. Fuller, Truro, N.S.

National Dairy Council of Canada.—President, E. H. Stonehouse, 186 King St. W., Toronto; Vice-President, F. M. Logan, Regina, Sask.; Secretary, D'Arcy Scott, Central Chambers, Ottawa.

New Brunswick Fruit Growers' Association.—President, W. B. Gilman, R.R. 6, Fredericton; Vice-President, A. R. Gorham, Greys Mills; Secretary, A. C. Turney, Fredericton.

Niagara Peninsula Growers Limited.—President, T. J. Mahony, R.R. 5, Hamilton, Ont.; Vice-President, A. A. Craise, R.R. 3, St. Catharines, Ont.; General Manager, C. W. Baxter, Grimsby, Ont.

Ontario Aberdeen-Angus Breeders' Association.—President, John McAllister, Guelph; Vice-President, R. H. McEwen, R. R. 4, London; Secretary, Jas. Bowman, Guelph.

Ontario Agricultural and Experimental Union.—President, J. Baker, Hampton; Vice-President, Wm. Elliott, Galt; Secretary, C. A. Zavitz, O.A.C., Guelph.

Ontario Apple Shippers' Association.—President, W. J. Bragg, Bowmanville; Vice-President, B. H. Coyle Colborne; Secretary, R. B. Scripture, Brighton.

Ontario Beekeepers' Association.—President R. G. Houghton, Barrie; Vice-President, Morley Pettit, Georgetown; Secretary, F. Eric Millen, O.A.C., Guelph; 2nd Vice-President, John A. McKinnon, Vankleek Hill, Ont.

Ontario Beet Growers' Association.—President, H. J. French, Dresden; Vice-President, Leo O'Neil, Wallaceburg; Secretary, J. L. Dougherty, Chatham.

Ontario Fruit Growers' Association.—President, Paul Fisher, Burlington; Vice-President, Howard Leavens, Bloomfield; Secretary, P. W. Hodgetts, Parliament Bldgs., Toronto.

Ontario Hereford Breeders' Association.—President, J. E. Harris, Kingsville; Vice-President, Edgar J. Hopper, St. Marys; Secretary, A. L. Currah, Bright.

Ontario Veterinary Association.—President, T. B. Buckley, 336 Dundas St. E., Toronto; Vice-President, J. Dunn, Barrie; Secretary, J. S. Glover, Walmer Road and Bridgeman St., Toronto.

Prince Edward Island Ayrshire Breeders' Club.—President, J. A. Clark, Charlottetown; Vice-President, T. A. Rodd, Winsloe; Secretary, Earle McRae, New Wiltshire.

Prince Edward Island Dairymen's Association.—President, J. H. Simpson; Vice-President, J. S. Cousins; Secretary, J. F. Profitt, Kensington.

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Prince Edward Island Potato Growers' Association.—President A. E. Dewar, Charlottetown; Vice-President, W. H. McGregor, Central Lot 16; Secretary, W. Boulter, Charlottetown.

Poultry Producers' Association of Ontario.—President, Lewis N. Clark, Port Hope; Vice-President, Colonel Delemere, Stratford; Secretary, C. M. Goddard, Britannia Heights, Ont.

Provincial O.A.C. Alumni Association. President, S. E. Todd, 186 King St. W., Toronto; Vice-President, J. B. Fairbairn, Beamsville, Ont.; Secretary, R. S. Duncan, Parliament Bldgs., Toronto.

Quebec Poultry and Pet Stock-Breeding Syndicate Limited.—Secretary-treasurer, P. E. Aird, 293 West Notre Dame, Montreal.

Saskatchewan Dairy Association.—President, J. A. Caulder, Moose Jaw; Vice-President, J. A. Smith, Duff; Secretary, P. E. Reed, Dairy Branch, Department of Agriculture, Sask.

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United Grain Growers Limited.—President, Hon. T. A. Crerar, Winnipeg; Vice-President, C. R. Jones, Winnipeg; Secretary, R. S. Law, Winnipeg.

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Western Grain Dealers' Association.—President, H. O. Heimbecker, 604 Lancaster Bldg., Calgary; Vice-President, C. W. Roenisch, 706 Lancaster Bldg., Calgary; Secretary, D. O. McHugh, 701 Lancaster Bldg., Calgary.

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Index to Seasonable Hints.—Complete from March, 1915, to November, 1923.

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PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

ORIGINAL ARTICLE

THE NEW NITROGENOUS FERTILIZERS OF GREAT BRITAIN

By E. J. RUSSELL, Director of the Rothamsted Experiment Station

The new nitrogenous fertilizers were already known and studied to some extent in Great Britain even before the War, but they played no very great part in practical farming. In this there were two reasons. In the first place the British farmer relies very largely on live stock to supply his land with nitrogen. A large number of cattle, sheep and pigs are kept, and over most of the country the system of husbandry centres round the animals.

There are however certain directions in which the new are able to compete successfully with the older fertilizers, and these will be considered under the various heads.

Nitrate of lime

This substance has been tested at a large number of centres and has usually proved as effective as nitrate of soda. Sometimes the one and sometimes the other has proved the better; but on an average the difference has been slight. The most extensive trials are those started before the War. Some typical results have been as follows:

	Mangolds											
	Midland Agricultural College, Derby 1915				Gloucester						Reading 1909 strong loam	
					Cirencester				Calcareous soil			
	Light soil		Heavy soil		1909		1910					
	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.
Nitrate of soda	29	8½	30	14	29	14	32	4	25	11	34	18
Nitrate of lime	28	8	30	4½	32	5	30	3	25	11	35	1
No nitrogenous top-dressing	20	10	25	18½	23	14	28	0	21	19	23	3

	Potatoes								Barley		Wheat	
	Woburn 1909 Sandy loam		Devon light soil		Jersey (5 centres)	Aberdeen various cent. 1907 1909			Rothamsted 1909		Rothamsted 1910	
	Tons	cwt.	T.	cwt.	lbs. per perch	t.	c.		Grain bus.	Straw lbs.	Grain bus.	Straw lbs.
Nitrate of soda	15	9	10	15	221	9	5		48·1	3,882	27·0	3,760
Nitrate of lime	15	6	10	7	228	9	6		46·2	4,449	20·7	3,618
No nitrogenous top-dressing	14	12	9	18	195	8	6		28·7	2,619	15·4	1,526

In practice nitrate of lime still suffers somewhat from the disadvantage that it is apt to turn sticky in a moist atmosphere and that it must be conveyed in casks, a fact which necessarily adds to the cost of transport. Further, it is not suitable for the mixed or "compound" fertilizers which are very popular in Great Britain. It has, however, the great advantage of containing calcium in place of sodium, and is therefore of value in two sets of conditions in England.

1. On heavy soils, since it does not cause the deflocculation and therefore the stickiness or "unkindliness" to use the farmers' phrase, which is often brought about by the nitrate of soda.

2. On soils deficient in lime, of which there are large areas in England, particularly in the west, where the calcium, small though it be in quantity, nevertheless proves of high value.

In the writer's view there is a distinct future for nitrate of lime in Great Britain, not in supplanting, but in supplementing, nitrate of soda and sulphate of ammonia.

Nitrate of ammonia

This substance became available for British farmers immediately the war was over, although in anticipation of the event the Rothamsted Experimental Station had made enquiries and experiments as to its probable value as fertilizer. Next to urea it is by far the most concentrated nitrogenous fertilizer on the market. When pure it contains 35 per cent of nitrogen, equivalent to 42½ per cent of ammonia. Half of the nitrogen is in the form of nitrate which is immediately available for the needs of the crop, and the other half in the form of ammonia which comes into action somewhat later. Samples examined at Rothamsted have been about 96 per cent pure, the remainder being mainly moisture; in this case the nitrogen content is 33½ per cent.

Further, as the ammonia is combined in the form of nitrate it has no exhausting effect on the lime of the soil, so that it can be used where there is a shortage of lime and where, therefore, there is reason to believe that sulphate of ammonia would not be wholly suitable. It is also entirely suitable for general farm crops and is perhaps the quickest-acting top-dressing known, being even more soluble than sodium nitrate, and at the same time, as part of its nitrogen is in the form of ammonia it is not so liable to loss if wet weather sets in after it has been applied to the soil.

Like some other very soluble substances, ammonium nitrate is liable to attract moisture from the air, and some samples become unmanageable because they form a tough cake which cannot easily be broken and may become pasty. There are, however, several varieties or modifications of ammonium nitrate, and one of them is free from this objectionable property. It is obtained by re-crystallizing under special conditions. This non-deliquescent variety keeps quite well in a dry shed; some of it was stored in the manure shed at the Rothamsted farm for ten months without becoming unmanageable. But it is by no means clear that this result could always be obtained, or that sufficient of the non-deliquescent variety could with certainty be manufactured to meet the needs of the farmers.

In the case of any fertilizer in England it is necessary to enquire how it would behave in admixture with others, partly because as already stated, farmers prefer to buy mixed or "compound" manures, and partly because even when they buy the several substances themselves they prefer to put them on altogether as far as possible, in order to save labour, a very serious item on British farms where wages are much higher than in many parts of the Continent. In the case of nitrate of ammonia, this question would not usually arise, as the proper use of this substance is as a top-dressing.

It was found however, that should the necessity arise, nitrate of ammonia would quite well mix with superphosphate so long as this material was dry and in good condition, but that if damp, noxious brown fumes were given off, as might be anticipated.

As a top-dressing it had the effect in some instances of scorching the leaves of the young plants, particularly in the drier, and warmer parts of the country. At Rothamsted a corp of mangolds was injured in this way in 1914, the small crystals falling on the leaves yielded so strong a solution that the plants suffered considerably. In later experiments the material was applied in a fine interval during showery weather, with the result that it was speedily washed off the leaves and caused no damage at any time. In experiments in the North, where the conditions are moister and cooler, no bad effects were observed.

The results of the experiments showed that nitrate of ammonia behaved very like nitrate of soda for farm crops: for example, for mangolds it was more effective than sulphate of ammonia when reckoned on an equal nitrogen basis, probably, because part of its nitrogen is already in the form of nitrate; for wheat it is equally effective. For potatoes, however, it is more risky than sulphate of ammonia: it gave

as large a crop, but induced the formation of a large growth of haulms, which would be a disadvantage whenever there was much blight. The results at Rothamsted have been:

	Mangolds Tons per acre	Potatoes Tons per acre	Wheat			
			Bus. per acre		Total produce including straw lb. per acre	
			Expt. 1	Expt. 2	Expt. 1	Expt. 2
Basal dressing:—						
+Nitrate of ammonia	23·3	8·8	44·7	37·7	8,120	7,830
+Sulphate of ammonia	18·6	8·7·	41·3	40·1	8,180	7,775
+No nitrogen	17·3	8·0	38·6	34·6	7,310	7,025

As compared with nitrate of soda it has sometimes proved more effective. Thus in an extensive series of twelve experiments on hay land carried out by Hendrick at Aberdeen, during the years 1911-1914 the results were as follows:

	Cwt. of Hay per acre
Basal dressing Nitrate of ammonia	56·2
" Nitrate of soda	53·8
" No nitrogen	50·2

Similar results have been obtained with oats and also with mangolds. It is quite possible that nitrate of ammonia is really the most effective and most valuable nitrogenous manure we have. But as against this enormous advantage there is the serious risk of deliquescence, and until this is greatly reduced it is unlikely that nitrate of ammonia will find an important place in the market.

Urea

Urea is the most concentrated of all nitrogen compounds offered to the farmer. It has not been the subject of many field experiments in England, but whenever tested as a fertilizer it has proved to be of the same order of value as sulphate of ammonia and nitrate of soda. The difference between these two fertilizers is in any case not very great. If the nitrogen in nitrate of soda is valued at 100 that of sulphate of ammonia is usually worth 96 to the farmer.

But in British farming it is always necessary to take account of possible harmful effects on the soil. Urea is singularly free from these; it does not make heavy soil sticky as nitrate of soda does nor does it remove lime from the soil as does sulphate of ammonia. The writer knows of no soils on which urea would be unsuitable. It mixes with practically every fertilizer and would cause a minimum of trouble to the manufacturer of mixed fertilizers and proprietary manures. Further, it does not wash out from the soil, but is retained probably as well as sulphate of ammonia, in which respect it is superior to nitrate of soda which in very wet districts, is liable to wash out.

So far as present evidence goes, and it seems quite sound, urea is more effective when drilled with the seed than when used as top-dressing. The experimental results at Rothamsted have been:

	Barley				Potatoes
	1921		1922		1921
	Grain Bushels per acre	Straw Cwts. per acre	Grain Bushels per acre	Straw Cwts. per acre	Tons per acre
Basal dressing:					
+Urea	34·0	23·4	33·4	21·8	2·63
+Sulphate of ammonia	35·0	23·5	32·3	20·3	2·31
+No nitrogen	26·1	17·6	25·2	16·8	2·00

The high percentage of nitrogen in urea gives it a great advantage wherever transport is an important consideration. For the export trade, or for farms situated a long distance from rail or canal, or wherever a long railway journey has to be made, there is a considerable advantage in handling a manure containing 37 per cent of nitrogen as is the case with urea, rather than in handling one containing only about half

this amount. Further, the freedom of urea from injurious secondary effects on the soil, to which reference has already been made, gives it special advantages wherever any such effects cause inconvenience to the farmer. If urea can be put on the English market at the same price per unit of nitrogen as sulphate of ammonia, it will undoubtedly prove a serious competitor. Even if it remained somewhat dearer there still remain distinct possibilities for it in cases where the lime-removing effect of sulphate of ammonia could not satisfactorily be remedied, and where nitrate of soda was unsuitable so long as the disparity of price was not too great.

Ammonium Chloride

For technical reasons ammonium chloride is one of the cheapest forms in which synthetic nitrogen can be put on the market.

On general grounds it would be supposed that the chloride and sulphate of ammonia must be of equal value as fertilizers. There is, however, much physiological evidence to the effect that the chloride under certain conditions may be harmful to plant growth. It by no means follows that this would happen in practice; whether it would or not can be ascertained only by trial. In view of the technical importance of the salt an extended investigation is being made at Rothamsted and at various centres in England under Rothamsted supervision.

The investigations proceed on two lines. Pot experiments are made to see whether the chlorine is exercising a harmful effect on the soil, or whether some of the soil constituents are mitigating or even suppressing the action.

Field experiments are made to discover to what extent field factors—such as subsoil, varying water supply, or indirect effects of ammonium chloride on the soil itself—influence the action of the fertilizer.

The pot experiments show conclusively that the chlorine ion has no visible toxic effect on the plant in soil *when all conditions are favourable to growth.* The chloride and the sulphate had at least equal value when compared on the basis of equal nitrogen content; indeed in the light soil the chloride usually proved the better.

Field experiments gave varying results. In many cases the chloride proved inferior to the sulphate, especially under rather dry conditions; in other cases there was no recognizable difference between the salts; while in a few cases the chloride appeared to give better results than the sulphate. It may of course be the case that this apparent beneficial action is simply the usual "scattering" of field trial results; this will become clear when more data have accumulated. But when the results are set out in detail there is a distinct suggestion that, in certain conditions, the chloride does in fact give better results than the sulphate. What these are can as yet only be conjectured and it is more profitable to await the results of further experiments.

There is, however, one objection to ammonium chloride which in some conditions might prove serious as it appears to increase the risk of loss by drainage. This action is more harmful than that of ammonium sulphate which leads to loss of lime and consequent acidity, because in the case of the sulphate, the calcium compound is certainly not harmful to the growing plant, while calcium chloride is injurious. The harmful effect could no doubt be reduced to a minimum by proper attention to time and method of application, and indeed it is a possible cause of the occasional beneficial results that have been noted above.

The field results have varied with the seasons. The season 1921 was hot and very dry.

In this year the nitrogen in ammonium chloride had approximately the value of 90, when that in ammonium sulphate was put at 100.

The season 1922 was cold and wet. The nitrogen in ammonium chloride, when that of the ammonium sulphate was put at 100, had the following values:—

For potatoes in 56 tests.....	99
For mangolds in 18 tests....	98
For cereals in 2 tests: Grain...	99
Straw...	105

The result is so near to 100 that it might at first be supposed that the ammonium chloride was fully equal to ammonium sulphate as fertilizer. Closer examination of the figures shows, however, that one or two results step out very much from the average and raise the value above its true level. When a distribution curve is drawn it is clear that the peak comes somewhere about 96-99 and for the present it is better to take this figure rather than the crude average as expressing the value of nitrogen in ammonium chloride when that in ammonium sulphate is put at 100.

Some of the individual results are as low as 83-88: these are invariably obtained with potatoes grown without dung and with kainit or potassium chloride. It is not usual to grow potatoes without dung but if for any reason this were being done, it would apparently be inadvisable to use ammonium and potassium chlorides together as fertilizer.

It is at present difficult to say what future lies before ammonium chloride as fertilizer. Almost everything will turn on the price at which it can be sold; it is undoubtedly of great value to the farmer, and when its various effects on the soil and the plant have become better known it will be possible to set out the conditions under which it can be used to the maximum advantage.

Cyanamide

It is perhaps hardly necessary to refer to cyanamide here since its direct action as fertilizer is not as good as that of the other substances to which reference has been made, and it can be converted by the manufacturer without great difficulty into one or other of them. There can be little doubt that this is the wisest procedure.

SCIENCE AND PRACTICE OF AGRICULTURE

AGRONOMY

573.—The Minimum Temperature of Germination of Seeds.—COFFMAN, F. A., *Journal of the American Society of Agronomy*, Vol. XV, No. 7, pp. 257-270, bibliography. Albany, N.Y., 1923.

Little information apparently exists upon the subject of minimum temperatures of germination of seeds of most of our commonly grown plants. The author's objects in these experiments were to determine: (1) The minimum temperatures at which seeds of different common crop plants would germinate; (2) the minimum temperatures at which satisfactory percentages of germination may be expected and the variations between such temperatures in different crops; (3) whether lower temperatures than those commonly used in seed testing laboratories would be beneficial in the germination of seeds.

Seeds of different species germinate very differently at different temperatures. Within a given species, starchy seeds appear to be unable to resist low temperatures to the same degree as the more oily seeds, without injury and reducing germination percentages. All of the small grains will germinate at the temperature of melting ice. Oats appear to be more effected by low temperatures than the other small grains. The strength of germination under freezing conditions appear to be in the following order: barley, rye, wheat, oats. It has been noted that under field conditions spring barley and rye will germinate more quickly than spring wheat and oats during seasons of low temperatures. Of the sorghums, the softer and more starchy varieties appear less able to withstand low temperatures than the harder seed types. Of our commonly grown crops, the seed of alfalfa and the clovers will germinate more readily at low temperatures than any of the others. From the results obtained in these tests it appears that it would be advantageous to use lower temperatures for the germination of alfalfa, clovers, and cereals than those now employed in seed testing laboratories.

609.—The Effect of Potassium and Magnesium upon the Quantity and Quality of the Potato Crop.—MARHOLT, D., *Die Landwirtschaftlichen versuchs Stationem*, Vol. C., Part 6, pp. 315-340, bibliography. Berlin, 1923.

The author gives a summary of the literature (dating from the time of Liebig), that deals with the effect of magnesium upon plants, and then passes on to describe his own experiments made during the three-year period 1917-1919, in the field belonging to the Chemical Laboratory of Giessen (Germany), on an alluvial clay of great water retaining capacity. The objects of the experiments were to determine how far the quantity and quality of the crop were influenced by: (1) various magnesian salts; (2) the separate introduction of the chloride, sulphate and carbonate of magnesium into a complete fertilizer; (3) the application of the salts combined with green manuring such as hop clover (*Trifolium procumbens*); (4) fertilizers like those mentioned in 2 and 3 supplemented with stable-manure.

The mineral fertilizer was composed of: sulphate of ammonia (53 pounds nitrogen per acre); basic slag (100 pounds of phosphoric acid per acre) potassic and magnesian salts (90 pounds of oxide of potassium, or magnesium per acre). The stable manure was applied at the rate of about 35,000 pounds per acre.

The results obtained show that:

(1) The salts of magnesium present in the soil have no favourable effect upon potatoes; the salts containing chloride of magnesium decrease, as compared with a complete fertilizer, the starch content of the tubers.

(2) In fertilizers that do not include substances forming humus, magnesian salts have very little effect upon the potato crop. In many cases, the application of sulphate of potassium alone produces as large, or almost as large crops as are obtained with potassic salts. +magnesian salts. Sulphate of magnesium sometimes

increases the yield; the carbonate and chloride are both less effectual.

(3) The effect of a complete mineral fertilizer is greatly increased by the addition of organic manure. Green manuring with hop clover considerably intensifies the favourable effect of a potassium-magnesian fertilizer, when the latter is applied in the form of sulphate. The absolute starch yield generally increases with the potato crop, but the starch content of the tubers is decreased by the green manure, especially if this is applied at the same time as a complete mineral fertilizer (nitrogen, potassium, sulphur). The percentage of starch in the potatoes is, on the other hand, slightly increased if sulphate of magnesium is also introduced. This percentage was 21.06 in the unfertilized plots; 19.52 in those receiving only green manure; 18.80 in plots with green manure + nitrogen + potassium (sulphate); 19.12 in plots with green manure, + nitrogen + phosphorus + sulphate of potassium and of magnesium. On the other hand, the absolute amounts of starch in quintals per hectare were respectively: 6.76-7.10-33.22-35.04, and the yield of tubers was respectively: 47.7-54.1-262.8-272.6 bushels per acre.

(4) The application of stable-manure increases the good effects of mineral fertilizer still more than green manure. A complete mineral fertilizer added to stable manure produces a crop of tubers 20 to 40 per cent higher than can be obtained when green manure is added to the organic manure, and 50 per cent higher if it includes the sulphates of potassium and magnesium. The effect of stable-manure upon the starch content of the tubers is similar to that of green manure.

The use of sulphate of magnesium as a fertilizer for potatoes is only to be advised when it is added to stable-manure applied at the same time as a complete mineral fertilizer.

361.—Hendrick, J.—Fertilizers before and after the War. Reprinted from *Transactions of the Highland and Agricultural Society of Scotland,* p. 22. Edinburgh, 1922.

Professor Hendrick reviews the position of the fertilizer industry from the year 1840 to the present time. He alludes to the dye and drug industries and points out that these do not give employment to more than a fraction of the labour required in the manufacture of fertilizers. Attention is drawn to the importance of the synthetic process for fixation of nitrogen. He considers that owing to competition amongst producers fertilizers will be cheap, also, that the variety is now greater than before and in consequence the farmer requires more knowledge respecting fertilizers and their uses.

611.—**Seed Mixtures for Grasslands.**—Stapledon, R. G., *Journal of the Ministry of Agriculture,* Vol. XXX, No. 2, pp. 130-142. London, May, 1923.

The author draws attention to the economic importance of selection of strain rather than depending only on species. This applies especially to white clover; the commercial Dutch should only be used on grassland reserved for two years for sheep grazing but white wild clover can be substituted on short duration grassland as it tends rapidly to form a dense sward. The respective values of early and late red clovers and imported cocksfoot are also indicated.

As regards the question of *complex or simple* seed mixtures, the author refers to three distinct objections to the former, viz. too much competition between the species, unsuitability of certain included species to particular conditions, and different requirements for germination. This points to the necessity for careful choice of mixtures.

Seed mixtures may be classified as follows: (*a*) Stubble; (*b*) one-year ley; (*c*) two-year ley; (*d*) three-year or upwards including permanent pasture.

Insufficient use is often made of stubbles. In Wales a plan has been adopted of sowing seeds with the cereals, solely for the purpose of providing autumn and winter keep until ploughing is begun. Quick growing red clover and Italian rye grass have given the best results (13 pounds per acre is recommended, sown directly after the cereal and harrowed in at the same time).

The following standard mixtures give an idea of the seeding rates which are generally adopted:

One-year ley: (*a*) For very heavy single hay crop:—Perennial rye grass 14 pounds + late flowering red clover 4 to 6 pounds + alsike clover 1 to 2 pounds; (*b*) for stubble grazing and aftermath as for hay:—Italian rye grass, 14 pounds + broad red clover 4-6 pounds + alsike, 1-2 pounds: (*c*) general purposes:—Italian rye grass, 6 pounds + perennial rye grass 10 pounds + late flowering red clover 2-3 pounds + broad red clover, 2-3 pounds + alsike, 1 pound; (*d*) for conditions unfavourable to the rye grasses but very favourable to timothy grass: timothy 10 pounds + alsike 6 pounds or timothy 10 pounds + late flowering red clover 4 pounds + alsike 2 pounds.

Two-year ley: (*a*) for soils where perennial rye grass is known to hold well into the second year: perennial rye grass 14 pounds + late flowering red clover 4-6 pounds + alsike, 1-2 pounds + wild white

clover, ¼ to ½ pound; (*b*) for soils where cocksfoot contributes in the second year to a larger extent than the perennial rye grass: cocksfoot, 10 pounds + timothy, 4 pounds + late flowering red clover 4-6 pounds + alsike 1-2 pounds + wild white clover ¼ to ½ pound or in proportions of 8 pounds + 8 pounds + 3 pounds + 4-6 pounds + 1-2 pounds + ¼ to ½ pound respectively; (*c*) for soils especially adapted to timothy: timothy 10-12 pounds + alsike 4-4 pounds + wild white clover ¼ to ½ pound (As timothy flowers so much later than other grasses, a combination of rye grass is not here recommended). The above mixture is an exceptionnally cheap one; (*d*) where it is necessary to rely chiefly on tall oat grass: Tall oat grass 16 pounds + late flowering red clover 4 pounds + alsike 1-2 pounds + wild white clover ¼ to ½ pound, or the same mixture, but with 8 pounds perennial rye grass and 8 pounds tall oat grass.

Long duration leys and permanent grass: (*a*) *for hay and pasture*:—a simple mixture for a three-year old ley is given as follows: perennial rye grass 16 pounds + cocksfoot (New Zealand) 10 pounds + timothy (Scotch) 4 pounds + late flowering red clover 4 pounds + trefoil, 1 pound + wild white clover 1½ pounds. Where, however, trefoil is not forthcoming (under conditions of high rainfall and on new calcareous soils) the following is considered a "sensible mixture":—perennial rye grass, 12 pounds + cocksfoot (New Zealand) 8 pounds + timothy 4 pounds + late flowering red clover (Welsh) 4 pounds + alsike 1-1½ pounds + wild white clover ¼ to ½ pound.

(*b*) *For grazing only*: perennial rye grass 10-12 pounds + wild white clover 2-4 pounds (sown under about two pounds of rape per acre or without any covering crop). Mixtures including coarser grasses such as rough stalked meadow grass may also prove advantageous.

In each case these mixtures would be most applicable to regions of high rainfall, and if intended for use in winter and early spring grazing the addition of a small quantity of cocksfoot, and timothy might perhaps serve a useful purpose.

388.—Influence of Vine Training on Fruit Production.—Auchter, E .C. and Ballard, W. R., *Bulletin No. 250, University of Maryland Agricultural Experiment Station,* pp. 207-234, bibliography. College Park, M.D., 1922.

Records of yields obtained from different varieties of vines trained according to five systems at the University of Maryland Agricultural Experiment Station viz.—Single Stem Four Cane kniffen, Single Stem Two Cane kniffen, Two Wire Umbrella or Umbrella kniffen, Munson 3 wire cross-bar system, and the Fan.

Under Maryland conditions, The Single Stem Two Cane kniffen appears to be the most satisfactory method. Posts are set 24 feet apart 3 vines between each two posts and no vine nearer than 4 feet from any post. The lower wire is placed 2½ to 3 feet from the ground and the upper wire from 2 to 3 feet above the lower one. First year the cane is pruned back to two or three buds, and the shoots staked or allowed to trail. Second year, all canes but one are removed and this is cut back to two or three buds. Third year, all canes but one removed and this should be carried to top wire and secured; all shoots should be retained, the excess canes can be removed at the next pruning, giving the vines the advantage of their growth during the summer. Vines pruned thus, often have the most vigorous shoots near the head. Fourth year: two vigorous canes selected just below the lower wire and trained to right and left along the wire, shortening back to four buds; a similar system is followed along the upper wire shortening back to about 6 buds. Two more canes are cut back to spurs close to the main stem at each wire and only one or two buds left. From such renewal spurs, canes for training along the wires will be developed for the following year. All other canes should be removed. Fifth year, training similar to fourth year system. In selecting the canes it is advisable to choose the round, medium sized ones, with average internodes and round buds. It will probably be profitable to select spurs on wood older than two years as shoots on such wood seldom bear fruit and will make good fruiting canes the next year. Canes on the upper wire should be cut back to about 10-12 buds and the forthcoming fruit bearing shoots allowed to droop down without tying. The number of buds to leave each year will depend on several factors but good vigorous, mature vines growing on average soil should show 30 to 40 buds *i.e.* 60 to 80 clusters of grapes.

The yields obtained per acre are distinctly higher with this system and with the others giving high grade fruit. The Munson system also gave good yields but the additional expense and time required for erecting the trellis, and the greater difficulties of picking and spraying make this method inferior. The three other less profitable systems of training are also described in detail, also several other less common methods applicable to weak growing varieties, when it is an advantage to train the shoots upright.

LIVE STOCK AND BREEDING

682.—The Feeding Value of Oat Straw. —COLLINS, S. H., *The Journal of the Ministry of Agriculture*. Vol. XXIX, No. II, pp. 993-997, bibliography, London, 1923.

Experiments have been carried out since 1920 at Armstrong College, Newcastle upon Tyne (England) with the two-fold object of determining the effect of natural causes in producing variations in the feeding value of oats, and of discovering the conditions necessary for the production of straw with a high nutritive value.

Starch is the principal carbohydrate found in straw and all the nitrogenous substances present are of great importance, since the proportion of non-albuminoid nitrogenous matters is very low.

An analysis of the straw harvested in 1919, 1920 and 1921, gave some indication of the effect of fertilizers on the feeding value of oat-straw. When a large amount of organic nitrogenous manure was used, the albuminoid content of the straw was 1.27 per cent higher than if very little of this fertilizer had been applied or none at all, and 1.30 per cent higher than that obtained with a top-dressing of sulphate of ammonia. As a rule, oat straw with a 1.28 per cent higher albuminoid content is obtained from the use of a large quantity of an organic nitrogenous manure than by the application of any other fertilizer.

On the other hand, it is probable that organic nitrogenous fertilizers decrease the amount of levulose in oat straw, and that from the point of view of sugar production, sulphate of ammonia is superior to organic nitrogen. By ploughing up an old field of thick clover, or applying a liberal dressing of stable-manure, the albuminoid or meat-forming substances in straw can be increased until they are 1.5 times higher than in the case of straw grown on badly cultivated land, but the proportion is reversed as regards the sugar content.

The author has also studied the connection between the variations in the albuminoid content of the straw and geographical position, and states that the albuminoid substances increase the further north the oat-crop is cultivated. This may be explained to some extent by the fact that as the vegetative period is shorter, there is less time for the grain to abstract as large an amount of nutritive substances from the straw as in the south, but it is equally possible that the difference in rainfall may have some influence.

In order to have a high sugar content, it is necessary to have fine weather at harvest time. When it is dry, the straw loses little of its sugar, but in wet weather, the sugar content is greatly reduced.

The albuminoid and sugar percentages varied from 1.1 per cent—8 per cent, and from 0.3 per cent—9.7 per cent respectively, that is to say, good quality oat-straw may have a higher feeding value than poor hay.

686.—The Laws of Heredity and the Breeding of Farm Animals.—HUNT, W. D., *New Zealand Journal of Agriculture*. Vol. XXVII, No. 2, pp. 103-111. Wellington, 1923.

The author draws attention to the importance of the stock breeder possessing marked ability in the selection of animals, as well as a knowledge of the laws of heredity.

The following is a brief record of results obtained by J. Gibson the well-known Tasmanian breeder of Merino sheep which are grown almost entirely for wool, the desire being to produce a sheep that would give the greatest amount of the best quality of wool. In 1868, he bred the ram Sir Thomas the most noted Merino of his time; the heaviest fleece cut from this ram for twelve month's growth was 12 pounds. The descendants of Sir Thomas given in order gave fleeces of the following weights respectively:—14 pounds, 17 pounds, 18 pounds, 20 pounds, 26 pounds, 23 pounds, 27 pounds, 30 pounds, 36¾ pounds.

Thus, in a little over thirty years by selecting those variations showing increased weight of wool, the weight was increased from 12 pounds to 36¾ pounds, and this was done entirely within the flock without bringing in any outside blood.

The discoveries of Mendel serve to explain the reason for many results, as for example, the fact that red calves sometimes appear in pure herds of black Aberdeen-Angus cattle. Black and red are Mendelian characters and black is dominant and red recessive, hence the result of crossing a black animal with a red would be a black animal although such a calf would carry in its germ-cells the factor for red. From the above it will be seen that, before a red calf can appear in black herd, both sire and dam must carry the factor for red; further, that if one animal were introduced into a herd which although itself black, carried the factor for red, it would be possible in time for red animals to appear. The only way to make sure of keeping red out of a black herd is as follows:—

(*a*) Before introducing a new bull into a herd, test it with red or red-and-white cows. If the bull is a pure black, all the calves will be black; if it carries the factor for red about half the calves will be red.

(*b*) Note results from bulls bred in the herd when used in cross bred herds. If any calves are red the bull carries the red factor. If the sire of this bull has been proved pure the red factor must have come from his dam, and the dam should be removed from the herd.

(*c*) If a red calf is born in a pure black herd the sire and dam must both carry the red factor, and both should be removed from the herd.

Every breeder will be trying constantly to bring his flock or herd nearer to his ideal. In order to do this he can use sires of type and ancestry as near to his ideal as he can get them, or he can select with a view to correcting some weakness in his own animals—that is, if his animals have gone to an extreme in one direction he can try to correct this by using sires that go to an extreme in the other direction.

The author considers that the first method is the best, as although the second method may produce animals of satisfactory appearance, they will not breed true.

To breed true the animals must have uniform germ-cells all carrying the same inheritance-factors. With an outcross there is always the danger of introducing germ-cells carrying the factor for some fault that may prove afterwards very difficult to eliminate, but experience has shown that animals which have been closely inbred for some time, respond quickly to an outcross.

The above consideration brings up the question whether the best plan in a large stud is not to divide the stud into several families and to closely inbreed each within itself until weakness appears; then introduce a sire from one of the other inbred families, and continue the inbreeding until another outcross is required, when another family can be used.

Another important matter when establishing a stud is that of location. Animals can be altered by environment and changes should all be in the direction of strengthening the type for the class of country in which they will live, or to which they will have to adapt themselves if sold. The location should be one where the conditions are such that natural selection will eliminate any individual unable to thrive under the conditions of the sires bred in the stud, where they are likely to be placed when sold.

691.—Controlling the Rations of Dairy Cows.—Leroy, A., *Revue de Zootechnie*, Year 2, No. 7, pp. 20-31. Paris, 1923.

Good results have been obtained in the Department of Seine-et-Oise by the simultaneous control of the milk yield and the rations of dairy cows. The control service which was instituted and is directed by the Stock-Breeding Committee (Comité d'Elevage) of the district has been placed under the management of the Departmental Agricultural Office. The method adopted is extremely simple and consists in periodically weighing the cows and their dairy ration. If this weighing is properly carried out, the work should be done in the same day as the milk is controlled, and can be done quickly and without a special staff, as approximate accuracy is sufficient for practical purposes. Having obtained these data, the controller is able, with the help of the existing tables giving the equivalent and percentage of the nitrogenous substances present in the various foods, to calculate feeding value and protein content of the ration. Since, on the other hand, he knows the average weight of the cows and the average yield of milk per head, he is also in a position to calculate with the help of the ration table the feeding value and protein content of the ration that is theoretically necessary for dairy cows of the same weight and giving the same amount of milk. By this means it can be ascertained if the cows are being properly fed, or whether the food requirements of any animal necessitate a change in the ration.

The results obtained by this double control were then plotted on two graphic charts, three curves being drawn showing respectively the effect of the ration on milk production, on butter yield and live weight. An examination of these charts shows the measures to be taken in every case and especially as to how the diet should be changed.

According to the author, these three rules can be deduced from the charts:

(*a*) If the curves of milk yield, butter production and live weight fall abruptly and are parallel, the ration must be increased.

(*b*) If the curves of milk yield and butter production fall slowly while the curve of the live weight remains horizontal, the cows are properly fed and no change should be made in the ration.

(*c*) If the curves of the milk yield and butter production fall slowly, while the weight curve rises decidedly, the animals are receiving too much food and the ration must be slightly reduced. In the last case, the tendency to put on fat which has already showed itself, will hinder milk production. It is however necessary in interpreting the graphs, to take into account any abnormal falls in the curves, as these are due to acute, or chronic affections which are quite independent of the diet.

692.—The Optimum Quantity of Skim Milk for Calf-Feeding.—Woodward, T. E., *Journal of Dairy Science*, Vol. VI, No. 3, pp. 243-244, Baltimore, 1923.

Feeding experiments were conducted at Beltsville, Maryland (U.S.) with 4 groups of calves with 4 calves per group, balanced as nearly as possible with reference to breed and body weight at birth. Each calf received its mother's milk until it was 10 days old; the change to skim milk was made gradually during the following 5 days, and the feed was then an entirely skim milk ration. One group was given a daily ration at the rate of $\frac{1}{7}$ body weight, two others at the rate of $\frac{1}{6}$ and $\frac{1}{5}$ and the fourth group was given all the milk the calves would drink, twice a day. The experiment lasted 70 days. Records were kept as to gains in weight made by calves on various quantities of skim milk; at least 50 per cent larger gains were noted for those receiving milk *ad lib.* than for those fed at the rate of $\frac{1}{7}$ their body weight. To do this they drank about 80 per cent more skim milk, about $\frac{4}{5}$ more than the first group. As regards the two other groups, less satisfactory results were obtained as it has been concluded that calves which received milk *ad lib.* and at the rate of $\frac{1}{7}$ made gains more economically than groups $\frac{1}{6}$ and $\frac{1}{5}$. In addition, feeding in large quantities did not cause scouring.

698.—Potatoes in Pig Feeding.—I. Muller and Richter, *Zeitschrift fur Schweinezucht*, Year II, Part 3, pp. 39-41. Neudamm, 1923.

II. Idem, *Ibidem*, No. 5, pp. 66-68.

I. *The use of large rations of Potatoes in Fattening Pigs.*—Owing to the heavy potato crop produced in Germany in 1922, and the high price of barley, the question arose as to whether it was not possible to entirely suppress the cereal ration, and yet supply fattening pigs with sufficient protein.

The authors carried out some experiments in which they used 9 pigs, 5 belonging to the native improved breed, and 4 Yorkshires. The average age of the animals was twelve months. During the summer, they had been turned out to graze, but had been given a small supplementary ration of concentrates. The pigs were fattened for 6 weeks from October 23, and received per head and per day: 200 gms. of fish meal + 200 gms. dry beer-yeast + boiled, mashed potatoes *ad lib.* The fish meal contained: crude protein 46.4 per cent, crude fat, 3.97 per cent, salt, 9.4 per cent. The dry yeast contained 49.6 per cent crude protein, the potatoes 12.2 per cent starch. As the mixture was very liquid, it was necessary, in order to prevent diarrhoea, to add 200 gms. chopped oat straw per head and per day. Initial weight 210 pounds. Food consumed per head per day, 31 to 40 pounds, average 35 pounds. Digestible protein ingested 9.3 ounces per head per day. The daily increase in live-weight was 25.6 ounces which was very satisfactory. In order to obtain 2.2 pounds increase in live-weight, 43 pounds potatoes + 1 pound fish meal and beer-yeast were required viz. 10 pounds of dry food.

It is thus quite possible and very economical to suppress all the barley-meal in the fattening ration of swine.

II. *Should fattening swine be given Potatoes?* Owing to the high price of fuel, it seemed worth while trying whether pigs could be fattened on raw potatoes. The authors carried out some experiments on 36 pigs of the ordinary breed, having an initial weight of about 120 pounds and which had been fed hitherto entirely on raw food. After a preliminary week of recuperation, the animals were given for 5 weeks, beginning from February 20, the following basal ration per head and per day: 22.4 ounces barley-meal + 4.8 ounces fish meal + 4.8 ounces beer-yeast + 0.6 ounce washed lime. As a complementary ration they were fed *ad lib.* *Lot I*: steamed potatoes; *lot II*: a mixture of $\frac{2}{3}$ boiled potatoes + $\frac{1}{3}$ raw potatoes; *lot III*: mixture of $\frac{1}{3}$ boiled potatoes + $\frac{2}{3}$ raw potatoes; *lot IV*: raw potatoes. The pigs fed raw potatoes showed no signs of digestive disturbances; while in the others the slightly laxative action of the cooked potatoes was evident and had to be corrected by the addition of a little chopped oat straw. Hence, the solanin in the potatoes had no injurious effect. The cooked potatoes however, were somewhat better assimilated, as shown by the fact that the pigs receiving them increased daily in live-weight more than twice as much as the others while consuming less food per unit of live-weight, as shown by the following table:

EXPERIMENTS IN FEEDING PIGS ON RAW AND COOKED POTATOES

Lot	Average initial live-weight	Average final weight	Ave. increase in live-wt.	Potatoes consumed per head per day	Consumption per 1 lb. increase in live-weight	
					Basal ratior	Potatoes
	lb.	lb.	lb.	lb.	lb.	lb.
I	121·7	173·1	1·5	17·2	1·5	11·7
II	126·3	163·9	1·1	16·5	2·0	15·4
III	123·4	155·1	0·9	15·8	2·4	17·6
IV	118·6	140·6	0·6	12·1	5·5	19·2

702.—Milk for Young Chicks.—DELMAS, F., *La Vie Agricole et Rurale*, Vol. XXIII, No. 30, pp. 66-69. Paris, 1923.

With the object of ascertaining whether giving milk to young chicks would prevent the great losses that frequently occur in very young broods, especially when they belong to the Mediterranean breeds, the author made experiments with 42 Leghorn chickens (of the white and brown varieties) that had been hatched on the same day. The chickens were divided into 2 lots each of 21 birds. The first lot was given milk with the addition of one-third water and weighed 987 gms. while the second had only water to drink and weighed 994 gms. Both lots were otherwise fed exactly alike. The chicks drank the milk-and-water with avidity. The experiment was continued for two months and the results obtained were indisputable; in the first lot, only two chickens died, whereas the number of deaths in the second was 6.

These results were confirmed by experiments conducted on vitamines, and if Vitamines A (antirachitis) is deficient in the food ration of chicks it should be introduced into the average ration, even if the ration contains sufficient vitamine B (antineuritic) from the liberal grain supply, and also plenty of vitamines C (antiscorbutic) which can be obtained from green food.

405.—Studies on Poultry Feeding.

I. SCHOFIELD, M.A. Feeding Milk to Poultry. *The National Poultry Journal*, Vol. LXII, Part 3, No. 116, p. 151. London, 1922.

II. WOOD, D. Feeding the heavy layer; How to supply the essentials to heavy Production. *Ibidem*, No. 117, p. 164-165.

III. BOSSERT, A. The Rational Feeding of Poultry. *Ibidem*. No. 126, pp. 295-297; No. 127, p. 305; No. 128, p. 319.

IV. DOBBIN, R. C. H. Some Lancashire Experiments. Wet versus dry Mash. *Ibidem*, No. 131, p. 363.

V. HEPBURN, J. S. , HOLDER, R. C. and others. Rations for feeding poultry in the Packing House. *United States Department of Agriculture, Bulletin* No. 1052, 24 p. Washington, 1922.

I. FEEDING MILK TO POULTRY.—The by-products of milk (skim milk, whey, butter, or condensed milk or whey, whether liquid or in powder), have proved most useful both in the feeding of chicks and of adult fowls. Powdered milk must be dissolved before use in ten times its weight of water. Its nutritive value if equal weights are taken, is the same as that of meat-meal.

Skim-milk can be fed either fresh or sour. It is a mistake to attribute the efficacy of skim milk or whey solely to the lactic acid they contain and to believe that lactic acid can be substituted for the above substances, although a small dose of lactic acid is very good for chicks, as it not only acts as a mild disinfectant of the digestive canal, but is also a stimulant and an excellent remedy against cocidiosis and other diseases. If however, an excessive amount of lactic acid is given, it does serious injury by destroying the mucous membranes; further, it is of no use in the feeding of adult fowls when a well balanced ration is given. Hence, it is best to reserve lactic acid for a medicine, and to use for food purposes only the by-products of milk.

Skim milk, whey, and a solution of powdered milk are put into the drinking-troughs. The acid solution is made into a mash. Milk powder can also be added to the mash in the proportion of 5 per cent to 10 per cent. About 1 gallon of mash per day is enough for 100 fowls. The whey, or solution of powdered milk, should be fed at the rate of at least 1 gallon a head for 100 head. By-products of sweet and of acid milk ought not to be given at the same time, but may be fed on alternate days.

From the results of his experiments, SCHOFIELD concludes that non-acid milk by-products suit young fowls better than acid ones which ought to be used as a condiment rather than as a food.

II. FEEDING THE HEAVY LAYER.—WOOD has studied the application to the heavy layers of our modern knowledge respecting the effect of the mineral constituents and the vitamines in the different feeds. As a result of his own experience, he suggests the following ration: equal parts of wheat and oats mash middlings + bran + gluten + fish-meal + chopped clover, or lucerne

hay + dried yeast + soy bean meal + ground oats (4:4:4:2:2:1:1). Once in three weeks 2 per cent of salt should be added to the mash, and once a fortnight 1 per cent (by weight) of crude cod-liver oil may be introduced.

III. The Scientific Feeding of Poultry.—A hen that is not laying should be fed, in order for the ration to be well balanced, for every 100 parts protein 452 parts of carbohydrates and 20 parts of fat. A hen laying 1—2—3—4—5—6—7 eggs weekly, ought to consume respectively, for every 100 parts of protein, 421—394—375—362—347—336—327 parts of carbohydrates and 26—30—33—36—39—41—43 parts of fat. In calculating the ration of a laying fowl, Bossert advises that the egg production should be estimated at 5—6 eggs per week, viz. the ratio should be 100 protein: 340 carbohydrates: 40 fats, or in the simplest terms, 10:34:4.

The following rations fulfill all these conditions per 10 head and per day:

(1) Middlings, 9 ounces + meat meal, 2½ ounces + wheat, 12 ounces + maize, 3½ ounces, + hemp seed 3½ ounces + bone-meal, ½ ounce + green food 1 pound 10 ounces.

(2) Middlings, 6½ ounces + fish-meal 3 ounces + wheat, 13 ounces + maize 3 ounces + hemp seed 5 ounces + bone-meal, ½ ounce + green food 1 pound 10 ounces.

The grain is given separately, but at the same time as other substances (which are mixed into a mash) both morning and evening; the green food is given mid-day.

IV. Dry versus Wet Mash.—This paper gives an account of various experiments described and discussed at a meeting of the Lancashire Utility Poultry Society. Most of the experiments had been carried out on the County Farm, at Hutton, and show that wet mashes should not be discontinued, but given alternately and supplemented by grain fed separately and by green food.

V. Fattening Rations for Poultry.—When, as is the case in the United States, poultry are sent long distances, they should not be fattened by the rearer, as the birds loose their flesh on the journey, and the sender cannot despatch them as frozen meat. Therefore, the poultry rearing industry has to be divided into two branches, the production and fattening branches respectively. Fattening takes 1 to 2 weeks and is carried out at the packing-houses.

Poultry-fattening as a specialized industry is making rapid progress in the United States; this induced the author to carry out his investigations in the Food Research Laboratory of the Department of Agriculture of the United States. He compared different rations and determined: (1) the increase in live-weight obtained; (2) the improvement in the edible portions of the fowl.

Two kinds of experiments were carried out; in the first various tests were made for each ration with 12 fowls fed and studied separately.

In the second class, the so-called Battery experiments a large number of fowls (up to over one thousand in a lot) were studied in flocks. The rations fed the control lot consisted of maize-flour and butter-milk (40:60). In the experiment rations part of the maize-flour and of the butter-milk was replaced by one or more of the following foods: barley maize-flour—whole oats—entire oat-meal—oat-meal patents—ground oats—rice bran—rice husks—ground rice—wheat offals—wheat middlings—coconut cake—ground decorticated ground-nut cake—undercorticated ground nut cake—colza cake—soy-bean cake—kafir—ground milo—lucerne—meat scraps—condensed whey—powdered whey. The fowls were weighed on the 1st., 4th., 11th. and 14th. days of the experiment.

One table gives the composition of the foods used the other 12 give the results of the experiments.

The averages of the most important results are to be found in the following table:—

Class of birds	No. of birds per class	Increase in 4 days		Increase in 8 days		Increase in 11 days		Increase in 14 days
		% of initial weight	% of total gain	% of initial weight	% of total gain	% of initial weight	% of total gain	% of total gain
Cockerels	612	12	30	23	57	31	78	40
Pullets	396	.....	.....	17	60	24	85	29
Adult cocks	336	11	50	17	77	21	93	22
Hens	456	4	34	8	65	10	84	12

The younger birds (cockerels and pullets) increased most rapidly in live weight when given a concentrated protein food such as cake, or meat scraps. The hens did not give uniform results, from which it would appear that meal suits them as well as a concentrated protein food.

The best length for the fattening period depends to a great extent upon circumstances. A fortnight is certainly not too long for cockerels, since they continue increasing in weight rapidly for this time; whereas pullets gain all their weight in 11 days. In the case of adult cocks and hens, the fattening period must be limited to 6-8 days.

The analyses made of different parts of the body of a large number of birds belonging to the various classes showed no difference produced by the rations on the edible portions, or the dressing losses, although the classes differ perceptibly in both these respects.

The yield of edible portions (in per cent of live weight) was for unfattened and fattened birds respectively: cockerels 56 and 60—pullets, 63 and 67—cocks, 62 and 64—hens, 70 and 71, which shows the advantage of fattening. In the last chapter is given the compositions of rations for fowls that are to be fattened.

704.—Effect on Egg Production of Artificial Lighting of Poultry Houses in Winter.—Denis, G., *La Revue Avicole*, Year 33, No. 3, pp. 195-197. Paris, 1923.

During the winter 1921-22, the author used to shut up his hens in the fowl-house as soon as it became dark, but he turned on the light from 9.30 p.m. to 10 p.m. and supplied the birds with food and water. As the arrangement gave good results, he repeated the experiment during the following winter with one important modification. The fowls were shut up when it became dark, but the henhouse was lighted from the time of their return until 10 p.m. Very small grain, barley and oats, and especially millet were scattered on the ground amongst the straw and sawdust, and at 9 p.m., the birds were given a grain different from that fed them during the day. The fowls had a liberal and varied diet: black oats, buckweat, barley and oats, millet and mixture (maize, hempseed and sunflower seeds) as well as paste every day early in the morning and household scraps with the addition of a little fish-meal or meat or meat meal and powdered oyster shells at 11 o'clock. Ten days after this regime was started, the birds' combs became of a brighter red and they regained their lively gait. By November 1, a large number of the hens were already laying; on the 15th, almost all were producing eggs, and on the 20th, out of the 115 fowls belonging to the various breeds which included White and Buff Wyandottes, White and Buff Leghorns, Black La Bresse and Bourbonnais, there was not a single hen that was not laying.

The author estimates that without the use of artificial light only 20 to 25 of the hens would have been laying and their egg production would have been much more irregular. The increased egg supply obtained would thus appear to be due to the influence of the light, which, by shortening the hours of darkness not only allowed the fowls to lay until 10 o'clock at night but also made it possible for them to take in the store of food needed for the production of a large number of eggs.

FARM ENGINEERING

734.—Electro-Culture Work in Great Britain, 1922-1923.—I. *Fifth Interim Report of the Electro-Culture Committee, Ministry of Agriculture.* London, 1923.—II. *Journal of the Ministry of Agriculture*, Vol. XXX., No. 4 pp. 321-326. London. 1923.

Experiments have been made by Prof. V. H. Blackman, with winter wheat and barley (Rothamsted Experiment Station), with cabbages, swedes, mangolds and potatoes (Harper Adams Agricultural College), and with potatoes at Lincluden. Laboratory investigations were conducted at the Imperial College of Science, London. Electrical measurements were made to determine the influence of an electro-culture installation on electrical conditions to leeward and windward. Pot culture experiments were made with barley to ascertain the stage at which the discharge can most advantageously be applied, the correct duration of the discharge and the result of normal atmospheric currents.

Results showed a very marked increase in grain yield as much as 118 per cent, but only a small increase in total yield. The effect was such that it established a differential action of the discharge—namely that of accelerating reproductive growth apart from vegetative growth—an effect hitherto unsuspected. Electrification for the first, second and third month respectively of the growing season gave in all cases an increase in yield, the second monthly period giving more than double that of plants not subjected to discharge. How far such an increase may be expected in other seasons remains yet to be determined. A current of lower intensity has been tried and if continued for the full period has been found equally effective, with the exception of the second month electrification system

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mentioned above. The removal of plants from the influence of the normal atmospheric current was accompanied by a slight reduction in yield.

Investigations have been in progress at Rothamsted to ascertain the best type of installation, the current required and the cost; the installation consists of 9 creosoted poles 24 feet in length of which 6 feet is sunk in the ground; the surporting wires are of rustless mild steel 125-130 yards long with twelve thinner wires of silicum bronze each 200 yards long; the porcelain rod insulators are 18 inches in length. The cost of installation and erection (materials, carriage, labour, travelling expenses and supervision) was £52 for 5 acres, *i.e.* about £10 per acre. It should not be taken for granted, however, that the cost of small installations can serve as a criterion of the cost in actual practice. The Agricultural Electric Discharge Company for example gives an estimate of £215 per 100 acres. The results from pot culture experiments are, however, important from the point of view of the installation required on an economic scale. It appears probable that lower level of wires would require a lower voltage. From the electrical measurements taken at Rothamsted on the wheat plot, on the stubble and on the field under installation, it has been concluded that with overhead wires whose distance apart is not much in excess of their height, fully half the current may be expected to reach the crop; also that a very considerable area surrounding the electro-culture area, specially on the leeward side, receives a discharge much in excess of that which passes normally between air and earth.

From the results obtained, there can be no question as to the economic application of electro-culture and the Electro-culture Committee consider that positive and economic conclusions will be reached by the end of 1925. It is proposed to concentrate attention solely on pot-culture, small plot experiments and laboratory investigations until that time when field experiments will be made, based on the scientific knowledge acquired in the preceding years.

AGRICULTURAL INDUSTRIES

782.—Cleaning Apparatus used in Machine Milking.—Burgwald, H. *U.S. Department of Agriculture, Farmers' Bulletin No. 1315*, pp. 15, figs. 13. Washington, D.C., 1923.

The Department of Agriculture of the United States has instituted a series of experiments in the sterilization of apparatus used in machine milking. Heat is the safest and simplest means of sterilization, the effect of which has chiefly been studied with reference to apparatus working in a vacuum, but the same principle could be applied with some small differences to other types.

The comparative bacterial counts made in the case of the apparatus sterilized with a solution of chloride of lime and with heat respectively have been favourable to the latter method. The average number of bacteria per cc. found in milk samples taken at 13 farms where other methods were employed was 257,900 whereas in the case of farms where sterilization by heat was practised, the average number of bacteria present was only 19,300 per cc. (the average age of the samples at the time the count was made was 12 hours).

The rubber portions of the apparatus were but little, if at all, more affected by the temperatures employed (71°C to 72°C) than when recourse was had to other methods of sterilization. The rubber must however be cleaned carefully before the heat is applied, for fatty substances exert an injurious effect at these temperatures.

The various operations of the process are explained by a series of diagrams. Immediately after milking, the apparatus is rinsed in hot water (which is in all cases sucked up by a vacuum system), 10 to 12 times in succession. It is then rinsed with water in which some cleansing substance has been dissolved, rinsed again, and subsequently immersed in water raised by steam to 160°-162°F. and kept at this temperature for 15-30 minutes. If no steam for heating is at disposal, it is best not to immerse the rubber portions until the heating is finished, in order to prevent their coming in contact with the wall of the heated receptacle. The vacuum tube ought to be cleaned every fortnight by the passage of hot water. The pails and covers should be sterilized with steam by preference, or else by means of immersion for 5 minutes in boiling water.

788.—Packing of Tomatoes for Market.—I. Parsons, F. E. Preparation of fresh tomatoes for Market.—*U.S. Department of Agriculture, Farmers' Bulletin No. 1291*, pp. 3-32. Washington, D.C.

II. Packing of Tomatoes for Export. *The Farmers' Weekly*, Vol. XXV, No. 650, p. 2323. Bloemfontein, 1923

There has been a serious lack of uniformity in the methods employed for packing fresh tomatoes for market and export. Parsons has inspected the important production centres in the United States and describes methods that have proved successful in commercial undertakings and others which have resulted in loss. As regards the suitability of certain packing

materials, the Chief of the Division of Horticulture, in South Africa, confirms the recommendations put forward in Germany and Holland with respect to the value of peat-mull. Ripe tomatoes packed in peat-mull retain their colour and hard skin as well as their juice and flavour. Evaporation is lessened and the weight of the fruit remains almost unchanged.

With the rise in temperature of the peat-mull, in the case of unripe fruits the ripening process is accelerated without causing shrinkage. In properly moistened, loosely spread out material, not only will the fruits be preserved but may even increase in weight and the colour and flavour is well developed. It takes from 5 to 7 times longer to evaporate the moisture in fruits if properly packed in dry peat-mull than would be the case if shelved and forwarded in the ordinary manner by insulated car. The antiseptic quality of peat-mull prevents bad fruits in a box contaminating the sound fruits.

481.—The Freezing Temperatures of Some Fruit, Vegetables and Cut Flowers.—Wright, R. C. and Taylor, G. F. *United States Department of Agriculture, Bulletin No. 1133, pp. 1-8.* Washington, D.C., 1923.

Determinations of the freezing points of a number of fruits and vegetables have been made, by the Bureau of Plant Industry in compliance with the ever increasing demands of trade and shipping.

Determinations were made as follows:

(1) Apples: Average 28.48° F.

(2) Bananas (green), peel 29.84° pulp 30.22°; ripe peel 29.36°, pulp 20.6°; blackberries 29.15°; cherries 27.81°; cranberries 26.7°; currants 30.21°; gooseberries 28.91°; grapefruit 28.36°; grapes 28.16°; loganberries 29.51°; oranges 28.03°; peaches 29.4°; pears (hard-ripe) 28.46°; soft ripe 27.83°; persimmons 28.33°; plums 28.53°; raspberries 30.41°; strawberries 29.93° F.

Vegetables.—Average for beans (snap) 29.74°; cabbage 31.18°; carrots 29.57°; cauliflower 30.08°; egg plant 30.41°; Kohl rabi 30.02°; lettuce 31.2°; onions (dry) 30.09°; peas (green) 30.03°; potatoes 28.92°; sweet corn 28.95°; sweet potatoes 28.44°; turnips 30.23° F.

Cut Flowers.—Petals and leaves of lilies, peonies, and roses from 27° to 31° F.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Any one desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

The Periodicity of Meteorological Factors in Relation to Agriculture.—Eredia, F., in *International Review of The Science and Practice of Agriculture,* Rome, July-September, 1923.

Phenology and Agriculture.—Scharfetter, R., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

The Status of the Movement to Establish Universal Standards for American Cotton.—Brand, C. J., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

Ploughing Without Turning the Furrow, in Austria.—Kallbrummer, H., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

329.—The Wheat Climate in Italy.—Azzi, G., *Nuovi Annali del Ministero per l'Agricoltura,* Year II, No. 3, pp. 453-624. Rome, 1922.

334.—Microflora of the Polar Regions.—Barthel, C., Den II. *Thule Ekspedition til Gronland Nordkyser,* 1916-18, No. 1. Copenhagen, 1922.

340.—The Effect of Potassic Fertilizers upon the Development and Chemical Composition of Different Cultivated Plants.—E. Godlewski, in *Comptes rendus des Séances de l'Académie d'Agriculture de France,* Vol. IX, No. 14, pp. 404-412. Paris, 1923.

346.—The Mosquito-Destroying Power of Algae Belonging to the Genus Chara.—Pardo, L., in *Boletin de la Real Sociedad espanola de Historia natural,* Vol. XXIII, No. 3, pp. 154-157. Madrid, 1923.

354.—Morphological Characters Used in Flax Selection.—Blaringhem, L., in *Revue de Botanique appliquée et d'Agriculture Coloniale,* Year 3, No. 17, pp. 3-26. Paris, 1923.

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357.—**Physiological Studies on the Action of Formaldehyde on Wheat.**—Atwood, W. M., in *The Botanical Gazette*, Vol. XXIV, No. 3, pp. 233-263. Bibliography of 58 works. Chicago, Ill., 1922.

358.—**Modern Seed Testing: The New Zealand Official Seed Station.**—Foy, N. R., in *The New Zealand Journal of Agriculture*, Vol. XXVI, No. 2, pp. 65-72. Wellington, 1923.

372.—**The Distribution of Varieties of Wheat in France.**—Bretigniere, L., in *Revue de Botanique appliquée et d'Agriculture Coloniale*, Bulletin No. 16, pp. 785-792. Paris, 1922.

388.—**Influence of Vine Training on Fruit Production.**—Auchter, E. C., and Ballard, W. R., Bulletin No. 250, *University of Maryland Agricultural Experiment Station*, pp. 207-234. Bibliography. College Park, Md., 1922.

404.—**Studies in Swine-Feeding.**—I. Poulain, A., *Office régional agricole du Midi, Bulletin trimestriel*, No. 4, pp. 1-25. Marseilles, 1922. II. Otto, *Deutsche landwirtschaftliche Tierzucht*, Year 26, No. 52, pp. 553-554. Hanover, 1922. III. Williams, D. W., and McConnell, O. E., Rice Bran for Fattening Hogs. *Texas Agricultural Experiment Station*, Bulletin No. 286, 15 pages, College Station, Brazos County, Texas, 1922. IV. Muller and Richter. *Zeitschrift fur Schweinezucht*, Year 29, Part 22, pp. 343-345. Neudamm, 1922. V. *Ibidem*, Year 30, Part 2, pp. 17-21, 1923.

410.—**The Effect of Change of Temperature on the Basal Metabolism of Swine.**—Capstik, J. W. and Wood, T. B., in *The Journal of Agricultural Science*, Vol. XII, Part 3, pp. 257-266, Cambridge, 1922.

412.—**The Sugars and Albuminoids of Oat Straw.**—Collins, S. H., and Thomas, B., in *The Journal of Agricultural Science*, Vol. XII, Part 5, pp. 280-286. Cambridge, 1924.

437.—**Restocking Streams.**—De Lachadenede, in *Revue des Eaux et Forêts*: Vol. LXI, No. 1, pp. 16-21. Paris, 1922.

438.—**Purification and Utilization of Drainage Water by Means of Carp Breeding.**—Leclerc, M. J., in *La vie agricole et rurale*, Year II. Vol. XXI, No. 38, pp. 215-216. Paris, 1922.

470.—**Equipment Adopted in Sweden for the Field-Testing of Fertilizer Requirements.**—Von Feilitzen, H., in *Meddelande Nr. 228 fran Centralanstalten for forsokscasendet pa fordbruksomradet*, 32 pages, Stockholm, 1922.

479.—**Studies on Hemp Retting.**—Rossi, G., in *Annali della R. Sculla Superiore d'Agricoltura in Portici*, Vol. XVII. Portici, Della Torre, 1922.

482.—**The Use of Morphological Phenomena in Research on the Watering of Milk.**—Spetelici, L., in *Bulletin de la Société Scientifique d'hygiène alimentaire et d'Alimentation rationnelle de l'homme*, Vol. X, No. 10, pp. 632-638. Paris, 1922.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief summary of the contents of the more important articles in the October-December number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

The Co-operative Purchase of Agricultural Requisites in Norway.—Seven pages. Gives an account of the origin and development of co-operative purchasing societies. The principal goods handled are fertilizers, feeding stuffs, seed, flour for domestic consumption, agricultural implements, fencing materials, electric apparatus, and oil for fuel. The central societies, called consortia, distribute the goods to the affiliated associations, including societies formed especially for the purpose, the agricultural societies and small holders associations, the dairies, cheese-making and co-operative productive societies.

The Problem of Increasing the Area of Land under Cultivation in Japan.—Thirty pages. A comprehensive article beginning with an account of the origin and development and present position of land ownership in Japan. The article then deals with the measures, legislative and other, taken to increase the area and productivity of the lands under cultivation, specialized and technical instruction, financial arrange-

ments, etc., and concludes with a statement of the results obtained.

The Share Renting of Farms in the United States.—Forty-three pages. An analysis of farm tenancy in the United States based on the census of 1920. The author deals with the subject under the following heads: where share renting is used in preference to cash; changes in the relative importance of share renting 1910 to 1920; principles underlying share contracts on farms; differences in share rental practice in widely separated parts of the United States; customary share rental practice used in raising some of the more important crops; the extent to which rented farms of different types are worked on shares; the size of share rented farms; some personal characteristics of share tenants, and the returns landlords realize from share rents.

More farm tenants pay share than cash rent in the United States. Of the farm tenants of known States three fourths (75.5 per cent) paid a share rent in 1919. Of all the farmers in the country 28 per cent were tenants who paid a share rent. In 40 of the 48 States and in 80 per cent of the counties of the country the share tenants on farms outnumbered the cash tenants.

The Teaching of Household Management in Italy.—Fourteen pages. Discusses the teaching of household management in women's training colleges and vocational schools, and gives an account of the various steps taken and resolutions passed in support of the spread of the teaching of household management.

Other articles in the October-December 1923 number of the "International Review of Agricultural Economics" are: The Russian Institute of Agricultural Co-operation at Prague; The Central Prussian Co-operative Bank; Recent Tendencies in the Organization of Agriculture in Germany; Agricultural Co-operation in Greece in 1921; Statistics of the Agricultural Consortia in Italy; The Progress of Co-operation in Palestine; Rural Co-operation in Roumania; The General Co-operative Bank of Russia; Municipal Hail Insurance in Alberta; Hail Insurance in Saskatchewan in 1922; The Constitution and Working of the Agricultural Mutual Insurance Societies in France; The Mutual Hail Insurance Society of the Spanish Farmers' Association; The Proposed State Agricultural Bank in Jamaica; The "Rabassa Morta" (an ancient form of agricultural agreement) in Catalonia; The Introduction of a Uniform Agricultural Tax in Russia.

THE CO-OPERATIVE SALE OF LIVE STOCK IN GERMANY

By A. BRENNING, General Secretary of the National Federation of German Agricultural Co-operative Societies

(Summarized from The International Review of Agricultural Economics)

While the beginnings of the modern agricultural co-operative movement in Germany are traceable to the middle of the last century, the co-operative sale of live stock only dates from its final decade. Such co-operation proved to be necessary as a consequence of the serious difficulties experienced in live stock dealing and in the distribution of meat.

In the regulations and instructions for the business of the societies in respect to the sale of live stock it is usually desirable to lay down the following principles:—

(*a*) A distinction between the classes of animals liable to compulsory delivery and others. Without a clear ruling on this point disputes with members are inevitable. Delivery is laid down as compulsory, for example, for pigs weighing more than 165 pounds, for calves of more than 90 pounds, or for all fat stock, such as pigs, sheep, calves, bullocks. It is essential to indicate specifically the animals exempt from compulsory delivery; *e.g.,* those under the prescribed weight, sick animals and those slaughtered for family use. Members, especially new members, may be exempted for a certain period from the obligation to deliver, *e.g.,* when they are bound by previous contracts. With these exceptions every breach of the obligation to deliver must be followed by the payment of a fine fixed at a fairly severe rate.

(*b*) The animal is handed over to the society at a fixed price or for sale on commission. In the first case account keeping is a simple matter, as the society buys on its own account. In the case of sale on commission, the animals are weighed and branded by means of stamps, clippings, earmarking, etc. The accounts are made up after the presentation of the salesman's charge, reckoning the expenses and apportioning them in respect of the different animals. Sale on commission has the great advantage of ensuring that the breeder receives the price obtained on the market while on the other hand the final payment tends to be delayed. The valuation of the animal is done by a committee formed for the purpose, thus preventing any possibility of discontent with the management of the society.

(*c*) The co-operative societies endeavour to protect themselves and their members against possible losses by means of insurance. This protection is however available only for members who have fulfilled their obligations, while any loss that may occur must be borne by those who, contrary to the provisions laid down in the rules may have delivered animals in an unsound condition, or animals which have been overfed.

(*d*) Sales to butchers and to private persons.

These societies are often accused of preventing or at any rate seriously interfering with the supply of fat stock to the locality. For this reason there is often a special clause in the rules, stating that all sales of stock to butchers or private persons in the towns and villages in the area of the co-operative society must be for slaughtering only and not for resale, and that the sale must only take place through the agency of the society.

The importance of the local societies for sale of live stock lies in their influence in regulating prices and in the stand they make against the manipulation of the trade. The author is in a position to state from his own experience that after the formation of such a society in a district on the borders of Germany, from which all the fat stock were sent to Berlin, the prices paid to the farmers went up 25 to 30 per cent in consequence of the competition set up with the dealers.

If however the farmers believe that they should always obtain higher prices from the co-operative societies than from the dealers, they forget that these conditions will necessarily come to an end from the moment when the ordinary trade finds itself forced by the competition of the societies to pay the higher prices equivalent to the market prices. This stage will however be reached only when the co-operative society takes its place as a competing and controlling body.

The object of the co-operative sale of live stock is first and foremost to check dishonest trade and to eliminate the surperfluous middleman. But there are also wider aims, and among them the desire to secure to farmers a proper influence on the movement of prices, which was hitherto solely dominated by the trade. A single co-operative society can only achieve this end to a limited degree, though it can be compassed by means of joint action among the co-operative societies and the introduction of various regulations upon the markets.

But if the co-operative sale of live stock is to accomplish its object, the institution of local co-operative societies is not sufficient, because these will always be dependent on the salesman in the large cattle markets for the sale of fat stock and on the dealer for the sale of breeding stock.

They can only escape from this dependence by combined action and the formation of central co-operative societies which will be able to make their influence felt far more effectively on the markets, and especially by establishing agencies on the large central markets. There are in existence to-day, in addition to 407 local co-operative societies, 19 central associations, most of which stand for one region or province. Of the 407 individual co-operative societies, 286, *i.e.* 70.3 per cent belong to the National Federation of German Agricultural Co-operative Societies (*Reichsverband der deutschen landwirtschaftlichen Genossenschaften*). At the present time the co-operative sale of cattle has so far developed that the central co-operative societies, partly acting in conjunction with the Chambers of Agriculture, have selling agencies on all the large markets of Northern, Central, Western and Southern Germany.

Long experience shows that favourable selling conditions or a tendency on the market to a rapid rise in values, which allow the dealer to offer high prices, has an unfavourable effect on co-operative sales. The cause of this is the shortsightedness of some agriculturists who are still uninstructed in co-operative principles, and incapable of understanding the necessity of remaining faithful at such times to the co-operative sales organization, so that the influence gained may not be lost, as it cannot be regained without serious difficulties and exceptional efforts in the competition with the trade.

It is well known that co-operative live stock selling is in opposition to the ordinary trade. It is not thereby implied that the co-operative societies oppose or regard as superfluous every kind of activity of the trade in this field; they deprive the trade of a certain part of its sphere of action, and do so deliberately, since they were formed with that object. What was the state of affairs in the past? An army of agents poured over the country districts keeping the prices to be paid to the farmer as low as possible and selling dear to the consumer. There were too many middlemen between the producer and the consumer.

The co-operative societies aimed, so far as possible, at suppressing the unnecessary intermediary trade. It is not therefore surprising that the trade threw all possible hindrances in the way of co-operative live stock societies. At the time when these societies were first founded, the trade tried to crush them by offering higher prices. Probably all the co-operative societies had much the same experience and not a few

were seriously crippled, as the farmers were not yet thoroughly imbued with the co-operative spirit.

Even in the future the activity of the societies will have to be confined to the sale of the live animals. Before the war the question of the formation of co-operative societies for slaughtering and the sale of meat was eagerly discussed by farmers. Denmark furnished the model, where from the end of last century co-operative bacon factories had been developed on a large scale. In Germany, however, conditions are essentially different, and experience shows that they are unfavourable to the establishment of such societies.

The general working of a co-operative slaughterhouse is too complicated; it requires the attention of a large staff and of an expert manager, enjoying the full confidence of the members, and there are also special difficulties in building up and keeping a circle of customers.

Collaboration is however possible between the co-operative societies of producers and of customers, that is between the agricultural co-operative societies and the distributive co-operative societies. In the *Konsumgenossenschaftliche Rundschau,* the organ of the Federation of German Distributive Co-operative Societies *(Zentralverband deutcher Konsumvereine),* of Hamburg, it was reported in 1920 that in Bavaria these societies had begun to buy and slaughter animals and to sell the dressed meat in the shops belonging to the Federation. Further developments have followed these lines. If the animals are purchased from the co-operative live stock societies, the most direct route from producer to consumer will be established. Both parties will attain a long desired end, and it will be possible to avoid that exaggeration in the application of co-operative methods, whereby the farmers, on the one hand, are urged to engage in the business of preparing their produce for the consumer in the form of bread, meat or sausages, and, on the other, the distributive societies are urged to take up agricultural production. On this point it is worth recalling what was said by Kaufmann, a member of the executive committee of the Central Federation of the German Distributive Co-operative Societies, on the occasion of the Congress of the Societies belonging to the Federation, held at Baden-Baden in 1921. Kaufmann remarked that there are limits even to the action of the distributive societies and that it is unnecessary to invade the sphere of agricultural production, as it is impracticable that the distributive societies should grow on their own farms the produce that the members require. He also observed that agriculture is peculiarly capable of adaptation to any form of economic organization and that it is particularly suited to a system of supplying to order, when agreements to furnish goods are established as between distributive co-operative societies and agricultural co-operative societies or individual farmers.

Reference may be made to one further point. The work of the co-operative societies demands a staff with high professional and technical qualifications, and also good business capacity. This holds good for all societies, but particularly for co-operative production and sale and for the sale of draught animals. The staff question is fundamental. It is essential that in this respect the societies should not fall behind the trade, if they do not wish to court defeat. It is true that it is not sufficient that the staff should have a purely business experience. The officers and the committee of supervision should bring to bear co-operative influence as strongly as possible and maintain it in full vigour. Otherwise it is to be feared that co-operative selling will become a mere counterpart of the trade, and that the co-operative societies themselves will lose their economic and social character, which makes them so valuable in the national interest. This danger must be avoided at all costs.

The difficult economic conditions of the present time demand the extinction of all unnecessary middlemen. This does not involve unreasonable claims on the part of the societies, nor any failure to recognize the right of honest trade to exist. There is adequate scope for the activities of both and the ruinous monopoly of either is the thing to be avoided. As in all co-operative work, so too as regards the sale of live stock, the object cannot be fulfilled unless individual farmers understand the necessity for maintaining in their own interest and by means of active personal support, the institutions set up by their own vocational organization. To achieve the aim desired, a continuous and active propaganda is essential. This however will undoubtedly be successful, since in effect co-operation is a question of good discipline and order.

CONGRESSES AND CONFERENCES

Fourth International Pedological Conference, May, 1924, at the International Institute of Agriculture, Rome. The International Pedological Committee decided at the meeting held in Zurich in June 1923 that this Conference should cover a period of 8 days. It is proposed that an International Pedological Association should be established. Excursions will be arranged in the district of Rome and characteristic parts of Italy during and at the close of the Conference. Communications should be addressed to the Comité organisateur italien de la IVe Conférence Internationale de Pédologie, Institut International d'Agriculture, Villa Umberto I. Rome (Italy).

International Seed Conference in London, July, 1924.—The information and decisions arrived at, at the International Seed Conference held at Copenhagen in 1921 are published in book form obtainable from Dr. Volkart, Zurich (Switzerland). Price 5 francs Swiss. A European Seed Association was subsequently established. On the invitation of the British representatives, the next Conference will be held in London and Cambridge.

International Congress and Exhibition of Social Economy at Buenos Aires (Argentine Republic) September, 1924.—This Congress and Exhibition will be held at Buenos Aires under the auspices of the "Museo Social Argentino", an unofficial institution in co-operation with the Argentine Government. The Congress will deal, *inter alia*, with agricultural questions, comparison of the importance of agriculture and commerce and industry in various countries, organization of agricultural credit and of international commerce in agricultural produce, etc.—Besides delegates representing national or municipal authorities any one interested can on payment of a fee, attend the Congress. Inquiries should be addressed to Museo Social Argentino, Maipu 126, Buenos Aires, Argentine Republic.

Imperial Botanical Conference, London, July 7, 1924.—At a representative meeting of botanists held at the Linnean Society's rooms it was decided to hold a Conference of British and Overseas botanists early next summer on the occasion of the British Empire Exhibition. It is expected that the Conference will include discussions upon modern aspects of systematic botany, ecology, morphology, plant-physiology, genetics, plant pathology, and upon the best means of effecting interchanges of students and staff between various parts of the Empire. The meetings will all be held within the week and excursions will be arranged for the week end and the beginning of the following week. (*The New Phytologist*, Vol. XXII, No. 3, London, 1923).

World Power Conference in London, July, 1924.—In connection with the World Empire Exhibition and organized by the British Electrical Association. It is hoped that a large number of technical and scientific institutions and industrial organizations in Great Britain and other countries will take part. The aim of this Conference will be to study the most advantageous methods of utilizing machine power to meet national and international requirements. From the agricultural standpoint, comparison will be made between the experiments carried out with a view to improvement in scientific agriculture, irrigation and transport.

International Exhibition of Milking Machines and Refrigerators at Buenos Aires, (Argentina), May 5, 1924.—Under the Direction of the Ministry of Agriculture. The exhibition will be divided into 4 sections: (1) Machines and implements connected with dairy farming and treatment of milk; (2) fodder for the milch cow and methods of preparation and preservation; (3) equipment for cold storage and technical methods employed; (4) literature, pamphlets, plans and publications in general. All exhibits will be accepted free of charge.

Communications should be addressed to the "Comité de la Exposicion International de Maquinaria de Lecherfa y Refrigeracion, Ministerio de Agricultura, Paseo Colon, 974, Buenos Aires.

First International Exhibition of Dairy Industry and Commerce at Milan, April 1-7, 1924.—Under the auspices of the Italian Government. Amongst those invited to participate are included small producers who can exhibit only a minimum portion of their produce.

Communications should be addressed to "Comitato della Mostra del l'Industria e del Commercio caseario, Milano".

British Empire Exhibition: Agricultural Section, April-Oct., 1924.—The Ministry of Agriculture and Fisheries is co-operating with the National Farmers' Union and the National Milk Publicity Council to put before visitors to the British Empire Exhibition at Wembley Park, London (April-October, 1924) a display that will convey an adequate picture of the history, progress and possibilities of land

cultivation in Great Britain and Ireland. There will be 240 feet range of show cases containing experimental subjects and samples of home products. Many phases of agricultural activity will be shown on the cinematograph, and some of the country's leading authorities on scientific agriculture will be present to explain the pictures and give lectures.

A completely equipped exhibition of dairy farming will be arranged by the Farmers' Union and Publicity Council. A dairy (100 feet by 70 feet) and a cow shed (30 feet by 70 feet) will be erected; 40 cows of the finest breeds will be housed in the shed and demonstrations made as to the most modern methods of milking and the dairy by-products.

AGRICULTURAL STATISTICS

AREAS SOWN WITH WINTER WHEAT AND RYE

Countries	Wheat			Rye		
	1923–24	1922–23	Average 1917–18 to 1921–22	1923–24	1922–23	Average 1917–18 to 1921–22
	Acres	Acres	Acres	Acres	Acres	Acres
Belgium	343,000	333,000	308,000	563,000	558,000	534,000
Bulgaria	1,989,000	2,260,000	2,043,000	.....	.....	.....
Spain	10,158,000	10,175,000	10,130,000	.....	.....	.....
Finland	.....	.....	.....	583,000	580,000	580,000
Latvia	74,000	72,000	58,000	657,000	650,000	576,000
Lithuania	179,000	173,000	87,000	1,415,000	1,430,000	1,237,000
Poland	2,572,000	2,362,000	.....	.....	.....	.....
Roumania	5,365,000	5,600,000	4,820,000	484,000	593,000	600,000
Czechoslovakia	1,362,000	1,310,000	1,402,000	2,111,000	2,070,000	2,150,000
Canada	767,000	878,000	703,000	.....	.....	.....
United States	40,191,000	46,090,000	45,310,000	4,377,000	5,506,000	5,990,000
Algeria	2,300,000	1,917,000	.....	.....	.....	.....
Tunis	1,161,000	1,450,000	.....	.....	.....	.....

FOREIGN CROP CONDITIONS

(February 20, 1924)

In numerous European countries the sowings were hindered, in the north by excessive rains, in the south by dry weather. While the actual data are yet far from complete, there is reason to believe that the aggregate extent of European cereal sowings differs but little from that of last year. Germination is backward in some countries, but is in the main regular.

Great Britain.—Persistent rains in December and January kept farm work behind throughout the country. Drier weather was experienced in the last week of January. The area under wheat is stated to be about 10 per cent less than last year.

France.—The winter wheat crops are of favourable appearance, although late sown plants are occasionally weak and thin as a result of excessive moisture. It is generally expected that the winter wheat acreage will be slightly above that of last year although considerably smaller than the pre-war average. Preparations for spring sowing are continuing actively.

Belgium.—Autumn sown crops have come through the adverse weather with little damage reported. Germination has been even and rapid.

Sweden.—Owing to a wet autumn and early winter it is estimated that the winter wheat area is 14 per cent less than that of last year and that of winter rye 21 per cent less.

Germany.—Mild weather prevailed in the last part of January. The crop outlook was satisfactory.

Russia.—Winter sowings in the southeast have been greatly extended this season, the estimated area under all grain being 13,-

500,000 acres, an increase of 31 per cent over last year. Latest reports comment favourably on the agricultural situation.

Italy.—The general crop outlook is described as satisfactory. The appearance of plants is promising in the south and of late has improved in the north.

The Balkan States.—The crops entered the winter in good condition and are protected by a thick covering of snow. The winter wheat acreage of Roumania is 4 per cent less than last year and that of Bulgaria 12 per cent less. The acreage of Jugoslavia and Hungary is reported to be about 10 per cent greater than last year.

North Africa.—In Algeria moisture conditions are good, and the crop conditions satisfactory. Good rains have fallen in Tunis and Morocco where drought was previously causing apprehension.

India.—The prospects of the wheat crop are favourable. The first estimate of the area under wheat is 30,203,000 acres which is an increase of 2 per cent over last year.

Argentina.—Harvesting of wheat is completed, favoured by excellent weather. Large crops of wheat and oats are confirmed, and there are prospects of a large corn crop.

Australia.—Fine crops of wheat were obtained in west and south Australia. The total crop of the country is now estimated as 125,830,000 bushels compared with 107,000,000 last year.

IMPORTS OF WHEAT BY COUNTRIES OUTSIDE OF EUROPE

(From Broomhall's Corn Trade News, January 15).

In addition to the disadvantage of unfavourable exchange movements, this country and Europe generally have found unexpected difficulty in supplying the requirements of bread grain, by reason of the continued heavy takings of the Orient. Shipments to ex-Europe reported this week are again over 4,000,000 bushels, whilst shipments to the United Kingdom direct are but 2,792,000 bushels, and the total for United Kingdom and orders 4,952,000 bushels—we might get all the orders, but the chances are that not more than half of them will discharge at our ports. A full normal weekly shipment for ex-Europe is some 1,760,000 bushels, and it goes without saying that if shipments to ex-Europe had averaged no more than this since August 1st, the additional quantities which would have been available to United Kingdom and Continent would have made a vast change in the supply position on this side of the world. The shipments to Japan are expected to continue until the import duty is re-imposed on April 1st, after which they may be light; but there may be no let-up of Chinese buying, whilst Manchuria talks of importing a million sacks of flour from America. If a part of the Chinese people are at last substituting wheaten bread for rice, millet, etc., it is difficult to guess how much wheat (or flour) will be taken in the season—it will be a big quantity.

THE BARLEY, OATS, CORN, FLAX AND SUGARBEET CROPS OF 1923

Tables giving the acreage, production and yield per acre of wheat and rye in 1923 compared with 1922 and the average of the five years 1917-21 were published in the *Agricultural Gazette* for January-February, at page 105. In the following tables similar data are presented for barley, oats, corn, flax and sugarbeets.

Barley.—The total production in 1923 for the countries for which figures are available is 1,163,348,000 bushels, an increase of almost 140,000,000 bushels over last year and of 160,000,000 bushels over the five year average. There was a total increase in Europe of 72,000,000 bushels made up mostly by increases of 35,000,000 bushels in Germany, 34,000,000 in Spain and 17,000,000 in Poland. There was a decrease of 35,000,000 in Roumania, but practically all the other countries of Europe show increases. Canada, United States, Algeria, Tunis and Argentina are the countries outside of Europe showing the largest increases.

Oats.—The total increase over last year is 467,000,000 bushels and 517,000,000 over the five year average. Of this increase over last year 298,000,000 bushels were in Europe, the greatest gains being in Germany, France and Poland. The only countries showing decreases were Esthonia, Finland, Lithuania, Norway, Roumania and Sweden. Outside of Europe there were increases in Canada, the United States, Algeria and Argentina.

Corn.—The totals have not been compiled for this cereal as for some of the countries mentioned estimates have not been received for all the years in question. The United States crop, which composes a large part of the world's total is 148,000,000 bushels greater than that of last year and 216,000,000 greater than the five year average. There are increases in most of the European countries. There is no estimate yet of the large Argentine crop now being harvested.

Flax.—There is a large increase in the production of flax seed in Argentina. India and the United States and Canada, the other big producers, also show increases. The production of flax fibre, with many countries yet to hear from, is about the same as last year.

Sugarbeets.—The total production is about the same as last year, but is nearly 8,000,000 tons greater than the five year average. There are decreases from last year in Germany and a few other European countries, and estimated increases in Italy, Sweden and the United States.

BARLEY

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Germany	3,214	2,847	2,831	108,447	73,838	82,209	33·7	25·9	29·0
Austria	333	313	246	7,501	5,599	4,576	22·5	17·9	18·6
Belgium	93	80	88	4,223	3,438	4,306	45·4	43·0	48·9
Bulgaria	531	534	539	12,282	11,941	8,970	23·1	22·4	16·6
Denmark	689	667	597	33,998	30,433	23,225	49·3	45·6	38·9
Spain	4,540	4,082	4,225	111,862	77,534	86,010	24·6	19·0	20·3
Esthonia	331	331	269	4,831	6,670	4,415	14·6	20·2	16·4
Jugoslavia	488	941	918	14,327	11,070	13,289	29·4	11·8	14·5
Finland	277	297	284	3,789	4,557	5,117	13·7	15·3	18·0
France	1,745	1,713	1,607	46,994	40,909	34,329	26·9	23·9	21·4
England and Wales	1,327	1,364	1,509	44,753	44,620	47,889	33·7	32·7	31·7
Northern Ireland	2	3	3	94	96	111	47·0	32·0	37·0
Hungary	1,176	1,145	1,225	24,649	22,170	21,540	21·0	18·4	17·6
Italy	568	576	530	10,477	8,254	9,022	18·4	14·3	17·0
Latvia	437	391	361	6,966	6,770	6,496	15·9	17·3	18·0
Lithuania	432	417	395	8,359	10,725	6,097	19·3	25·7	15·4
Luxemburg	5	9	6	138	177	111	27·6	19·7	18·5
Norway	132	132	148	3,800	4,483	4,916	28·8	34·0	33·2
Netherlands	59	61	57	2,922	3,196	2,683	51·1	52·4	47·1
Poland	2,964	2,824	2,610	76,037	59,559	58,151	25·7	21 1	22·3
Roumania	4,641	4,269	3,669	58,480	93,780	56,430	12·6	21·0	15·4
Sweden	410	427	421	11,712	13,830	11,828	28·6	32·4	27·1
Switzerland	16	16	19	570	482	631	35·6	30·1	33·2
Czechoslovakia	1,697	1,668	1,662	55,177	46,352	42,355	32·5	27·8	25·5
Total Europe	26,107	25,107	24,219	652,388	580,483	534,706	24·9	23·1	22·1
Canada	2,785	2,600	2,708	76,998	71,865	62,351	27·8	27·8	23·0
United States	7,905	7,317	8,032	198,185	182,068	186,854	25·1	24·9	22·5
Lebanon	64	64	.....	1,194	730	.....	18·7	11·4	.....
Japan	2,515	2,746	2,912	88,813	87,138	92,073	34·3	31·7	31·6
Korea	.....	.....	.....	30,721	32,889	33,897	.....	.....	.....
Palestine	.....	.....	.....	1,026	1,475	2,034	.....	.....	.....
Algeria	2,827	2,868	2,717	45,149	19,805	34,886	16·0	6·9	12·8
Egypt	400	375	385	11,989	11,306	11,189	30·0	30·1	29·1
Morocco	2,866	2,548	2,246	32,736	27,230	32,805	11·4	10·7	12·4
Tunis	1,206	503	1,173	11,482	1,837	8,102	9·5	3·0	5·9
Argentina	638	600	625	12,667	7,656	3,282	19·9	12·8	5·3
Grand Total	47,313	44,828	45,017	1,163,348	1,024,482	1,002,179	24·6	22·1	21·5

OATS

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Germany	8,262	7,912	7,670	395,976	260,373	307,725	47·9	31·9	40·1
Austria	801	704	633	24,358	17,239	15,244	30·4	24·5	24·1
Belgium	652	717	583	34,217	33,679	30,259	52·5	47·0	50·9
Bulgaria	344	352	338	9,461	8,606	6,429	27·5	24·4	19·0
Denmark	1,119	1,119	1,023	64,842	54,969	43,249	57·9	49·1	42·3
Spain	1,595	1,514	1,533	38,044	29,378	31,970	23·9	18·4	20·9
Esthonia	399	399	346	9,224	9,466	7,706	23·1	23·7	22·3
Jugoslavia	1,000	983	1,016	18,215	17,197	19,364	18·2	17·5	19·1
Finland	1,038	988	1,038	20,036	26,540	24,932	19·3	26·9	24·0
France	8,545	8,492	7,999	355,272	271,311	224,531	41·6	31·9	28·1
England and Wales	1,976	2,157	2,405	87,097	82,485	105,347	44·1	38·2	43·8
Northern Ireland	390	400	423	20,109	20,199	21,601	51·5	50·5	51·1
Hungary	856	811	844	24,144	21,227	20,834	28·2	25·2	24·7
Italy	1,223	1,214	1,184	37,485	28,673	33,701	30·6	23·6	28·5
Latvia	764	681	622	19,311	17,102	15,852	25·3	25·1	25·5
Lithuania	816	769	7 04	20,347	27,240	14,962	24·9	35·4	21·3
Luxemburg	64	71	61	2,723	1,437	1,494	42·5	20·2	24·5
Norway	301	301	325	9,413	12,593	14,444	31·3	41·8	44·4
Netherlands	379	394	389	22,534	18,728	20,141	59·5	47·5	51·8
Poland	6,215	5,879	5,050	228,400	162,469	147,025	36·7	27·6	28·1
Roumania	3,324	3,295	2,725	61,805	86,658	63,392	18·6	26·3	23·3
Sweden	1,801	1,799	1,802	62,832	74,310	63,641	34·9	41·3	35·3
Switzerland	51	51	54	2,879	2,321	3,448	56·5	45·5	63·9
Czechoslovakia	2,081	2,017	1,967	81,193	67,344	62,938	39·0	33·4	32·0
Total Europe	43,996	43,019	40,734	1,649,917	1,351,544	1,300,229	37·5	31·4	31·9
Canada	13,727	14,541	15,171	537,733	491,239	436,130	39·3	33·8	28·8
United States	40,800	40,790	42,776	1,299,823	1,215,803	1,272,736	31·8	29·8	29·8
Algeria	596	583	586	15,011	5,243	12,818	25·2	9·0	21·9
Morocco	33	28	21	1,084	169	368	32·8	6·0	17·5
Tunis	121	112	152	2,594	746	3,197	21·4	6·7	21·0
Argentina	2,747	2,618	2,529	77,211	51,742	40,424	28·1	19·8	16·0
Grand total	102,020	101,691	101,969	3,583,373	3,116,486	3,065,902	35·1	30·6	30·1

CORN

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Austria	145	148	106	3,710	3,461	2,255	25·6	23·4	21·3
Bulgaria	1,199	1,313	1,414	22,007	15,479	18,616	18·3	11·8	13·2
Spain	1,169	1,159	1,174	23,925	26,832	26,331	20·5	23·2	22·4
France	760	790	796	11,857	12,676	11,924	15·6	16·0	15·0
Hungary	2,466	2,445	2,092	55,158	48,725	40,933	22·4	19·9	19·6
Italy	3,707	3,811	3,821	84,248	76,796	87,336	22·7	20·2	22·9
Poland	189	183	132	.....	2,776	2,266	.....	14·7	17·2
Roumania	8,397	8,411	8,327	174,110	116,050	146,484	20·7	13·8	17·8
Switzerland	4	4	6	165	185	284	41·2	46·2	47·3
Czechoslovakia	397	392	377	10,455	9,884	9,540	26·3	25·2	25·3
Jugoslavia	.....	4,722	4,566	88,579	89,797	87,463	.....	19·0	19·2
Canada	318	318	268	13,608	13,798	13,629	42·8	43·3	51·0
United States	104,158	102,946	102,882	3,054,395	2,906,020	2,838,160	29·3	28·3	27·6
Guatemala	457	455	561	7,874	5,412	6,274	17·2	11·8	11·2
Philippines	1,378	1,359	1,166	16,663	14,651	14,451	12·1	10·8	12·4
Algeria	22	19	19	169	276	268	7·7	14·5	14·1
Tunis	45	.....	42	284	.....	276	6·3	.....	6·6
Java and Madura	4,030	3,887	4,182	50,116	47,501	53,424	12·4	12·2	12·8

FLAX

Countries	Area			Production of Flaxseed			Production of Fibre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Centals (100 lb.)	Centals	Centals
Belgium	45	41	72	396	356	555	403,700	334,800	735,800
Bulgaria	1	2	1	11	15	5	5,500	6,500	2,600
Spain	4	4	4	51	51	45	11,700	14,200	22,200
Esthonia	59	59	45	304	328	266	198,000	207,500	145,900
Finland	11	14	14	.....	.....	.....	.....	.....	.....
France	35	38	61	.....	223	473	.....	207,700	385,600
Northern Ireland	45	29	77	.....	.....	.....	149,900	105,300	217,600
Hungary	5	7	10	.....	41	71	.....	51,900	74,200
Italy	70	52	48	390	413	426	52,700	49,800	58,400
Latvia	140	93	84	982	563	625	541,800	375,600	306,800
Lithuania	129	127	139	964	1,108	916	442,200	451,900	454,200
Netherlands	24	24	30	.....	242	322	135,200	96,900	150,500
Poland	256	252	205	2,338	1,995	1,439	.....	1,137,700	1,021,300
Roumania	31	27	30	.....	194	151	.....	31,100	21,400
Czechoslovakia	53	56	56	427	312	307	300,800	277,300	287,600
Canada	630	566	1,008	7,140	5,009	5,914	.....	.....	.....
United States	2,061	1,113	1,652	17,429	10,375	9,718	.....	.....	.....
India	3,358	3,011	2,957	21,280	17,440	15,800	.....	.....	.....
Algeria	1	1	1	10	6	10	.....	.....	.....
Tunis	7	4	7	47	4	50	.....	.....	.....
Argentina	5,255	4,194	3,936	63,241	47,576	39,262	.....	.....	.....

SUGAR BEETS

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Tons	Tons	Tons	Tons	Tons	Tons
Germany	948	1,031	836	9,585,425	11,895,785	7,978,340	10·1	11·5	9·5
Austria	32	28	17	237,270	190,510	110,020	7·4	6·8	6·5
Belgium	179	149	127	1,993,535	1,863,860	1,468,335	11·1	12·5	11·6
Bulgaria	31	24	26	168,655	235,680	109,890	5·4	9·8	4·2
Denmark	78	60	90	903,900	630,975	1,005,280	11·5	10·5	11·2
Spain	153	138	151	1,344,825	1,624,355	1,430,550	8·8	11·8	9·5
Jugoslavia	49	48	40	330,695	344,680	216,655	6·7	7·2	5·4
Finland	3	3	2	5,510	12,675	11,315	1·8	5·1	5·7
France	365	323	248	3,552,160	3,625,935	2,132,430	9·7	11·2	8·6
Hungary	135	104	90	971,745	783,905	651,895	7·2	7·5	7·2
Italy	210	203	125	3,031,365	2,486,490	1,468,065	14·4	12·2	11·7
Netherlands	166	138	137	1,889,105	2,003,980	1,942,485	11·4	14·5	14·2
Poland	337	270	197	2,838,045	2,944,750	1,244,285	7·4	10·9	6·3
Sweden	106	41	94	1,096,805	503,195	1,126,535	10·3	12·3	12·0
Switzerland	3	3	2	35,275	37,480	23,125	11·8	12·5	15·4
Czechoslovakia	574	519	531	5,686,995	5,776,295	4,878,950	9·9	11·1	9·2
Canada	22	21	24	216,200	190,400	243,600	9·6	9·2	10·0
United States	651	530	717	6,893,000	5,183,000	6,849,740	10·6	9·8	9·6
	4,042	3,633	3,454	40,780,910	40,333,950	32,891.495	10·1	11·1	9·5

THE WORLD'S LIVE STOCK

The following tables give, as far as official statistics are available, the numbers of horses, cattle, sheep and swine in the different countries in 1913 and in each year from 1919 to 1923. The figures for 1913 for some of the countries of Europe are not strictly comparable with those of the later years on account of territorial changes, but as a whole the tables show pretty clearly the fluctuations in the numbers of live stock during the last ten years.

The data in these tables have been taken from the International Yearbook of Agricultural Statistics and other publications of the International Institute of Agriculture which has collected all the official statistics issued by the different countries.

HORSES

Thousands

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	4,523	3,465	3,588	3,666	3,648	..
Austria (a)	(b) 1,802	243	253	..	..	..
Belgium	267	162	205	222	230	..
Bulgaria (a)	(b) 478	..	412	..	..	..
Denmark	535	558	602	598	576	562
Spain	541	594	..	722	594	..
Esthonia	..	165	165	..	199	..
Jugoslavia (a)	(c) 153	..	1,127	1,059	1,043	..
Finland (a)	(b) 366	..	385	393	..	..
France	3,222	2,503	2,635	2,706	2,778	..
Great Britain	1,324	1,338	1,312	1,340	1,308	1,253
Greece (a)	(d) 149	..	201	..	..	..
Hungary (a)	(d) 2,352	..	635	..	..	..
Italy	(e) 956	990	..	..	..	..
Latvia	..	..	261	283	303	338
Lithuania	..	..	380	440	..	..
Norway	(b) 168	221	215	..	..	..
Netherlands	334	362	..	364	..	..
Poland	..	..	..	3,201	..	..
Roumania (a)	(d) 825	1,380	1,485	1,687	1,802	..
Russia-in-Europe (a)	24,504	..	16,966	17,109	..	..
Sweden	599	716	728	..	..	..
Switzerland	(d) 144	124	130	134	..	..
Czechoslovakia (a)	..	..	592	..	..	..
North America—						
Canada	2,866	3,667	3,400	3,814	3,649	3,531
Cuba	625	779	..	859	..	..
United States	20,567	21,482	19,766	19,208	19,056	18,853
Mexico	..	..	929	..	..	..
South America—						
Argentina	8,324	9,293	9,367	9,432	..	..
Brazil	7,290	..	5,254	..	..	..
Paraguay	478	490	..	..	..	..
Uruguay	556	555	..	..	..	..
Asia—						
India	1,555	1,688	1,718	1,697	1,684	..
Japan	1,582	1,480	1,468	1,511	..	..
Philippines	179	255	269	..	..	..
Russia-in-Asia	9,359	..	7,431	6,792	..	..
Africa—						
Algeria	216	..	201	..	..	..
Morocco	123	174	139	143	150	..
South Africa	719	695	690	920	..	..
Australasia—						
Australia	2,523	2,421	2,416	2,438	..	..
New Zealand	404	363	346	337	332	332

(a) The figures for 1913 are not comparable with those of later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908.

CATTLE

(Thousands of Head).

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	20,994	16,318	16,806	16,791	16,309	.....
Austria (a)	9,160	1,719	2,320	.....	.....	.....
Belgium	1,849	1,286	1,487	1,515	1,517	.....
Bulgaria (a)	1,606	.....	2,288	.....	.....	.....
Denmark (a)	2,254	2,188	2,504	2,591	2,525	2,537
Spain	2,879	3,397	.....	3,718	3,297	.....
Esthonia (a)	.....	407	442	.....	527	.....
Jugoslavia (a)	(c) 957	.....	3,684	4,834	4,058	.....
Finland	(b) 1,606	1,445	1,824	1,792	.....	.....
France	14,788	12,789	13,217	13,343	13,576	.....
Great Britain	6,964	7,424	6,713	6,660	6,870	7,017
Greece (a)	(d) 298	.....	659	.....	.....	.....
Hungary (a)	(d) 7,164	.....	1,971	.....	.....	.....
Italy	(e) 6,199	6,239	.....	.....	.....	.....
Latvia	.....	.....	768	800	811	899
Lithuania	.....	.....	865	950	.....	.....
Luxemburg	102	89	.....	.....	83	.....
Norway	1,133	1,050	1,095	.....	.....	.....
Netherlands	2,097	1,969	.....	2,063	.....	.....
Poland	.....	.....	.....	7,895	.....	.....
Roumania (a)	(d) 2,667	4,634	4,730	5,521	5,745	.....
Russia-in-Europe (a)	37,139	.....	27,490	28,805	.....	.....
Sweden	2,723	2,551	2,736	.....	.....	.....
Switzerland	1,443	1,433	1,382	1,425	.....	.....
Czechoslovakia (a)	.....	.....	4,391	.....	.....	.....
North America—						
Canada	6,656	10,085	9,572	10,206	9,720	9,246
Cuba	3,141	3,966	.....	4,771	.....	.....
United States	56,527	68,560	67,120	65,587	65,632	66,352
Guatemala	557	.....	297	319	.....	.....
Jamaica	116	170	158	141	141	.....
Mexico	.....	.....	2,163	.....	.....	.....
South America—						
Argentina	25,867	27,721	27,943	28,138	(g) 37,065	.....
Brazil	30,705	.....	34,271	.....	.....	.....
Chili	2,084	2,163	.....	.....	.....	.....
British Guiana	81	79	86	84	74	.....
Peru	1,000	.....	.....	1,302	.....	.....
Paraguay	5,249	5,500	.....	.....	.....	.....
Uruguay	8,193	7,802	.....	.....	.....	.....
Asia—						
Ceylon	1,484	1,599	1,600	1,386	.....	.....
Korea	1,211	1,462	1,490	.....	.....	.....
India	(f) 120,420	(f) 129,591	117,559	116,736	116,665	.....
Japan	1,389	1,345	1,376	1,437	.....	.....
Philippines	418	679	761	.....	.....	.....
Russia-in-Asia	14,216	.....	11,329	9,888	.....	.....
Siam	2,360	2,542	2,621	2,625	2,864	.....
Africa—						
Algeria	1,108	.....	1,093	.....	.....	.....
Egypt	637	505	562	596	585	.....
Kenya	.....	.....	2,510	2,559	2,814	.....
Madagascar	5,540	7,278	7,519	7,661	.....	.....
Morocco	675	1,322	1,494	1,517	1,558	.....
South Africa	(d) 5,797	5,575	5,975	8,557	.....	.....
Australasia—						
Australia	11,484	12,711	13,500	14,530	.....	.....
New Zealand	(d) 2,020	3,035	3,102	3,139	3,323	3,475

(a) The figures for 1913 are not comparable with those of the later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908. (f) including buffaloes. (g) Census.

SHEEP

Thousands

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	5,521	5,341	6,150	5,891	5,566	.....
Austria (a)	(b) 2,428	.....	454	.....	.....	.....
Belgium	185	.....	.....	.....	.....	.....
Bulgaria (a)	8,669	.....	8,906	.....	.....	.....
Denmark	727	509	540	522	442	374
Spain	16,441	19,337	.....	20,522	19,377	.....
Esthonia	.....	420	530	.....	745	.....
Jugoslavia (a)	(c) 3,819	.....	5,302	6,773	8,462	.....
Finland	(b) 1,330	815	1,704	.....	1,572	.....
France	16,131	9,022	9,406	9,600	9,782	.....
Great Britain	23,931	21,534	19,744	20,490	20,122	20,621
Greece	(d) 3,545	.....	5,811	.....	.....	.....
Hungary (a)	(d) 8,548	.....	1,284	.....	.....	.....
Italy (a)	(e) 11,163	11,754	.....	.....	.....	.....
Latvia	.....	.....	998	1,132	1,167	1,461
Lithuania	.....	.....	730	750	.....	.....
Norway	b) 1,398	.....	957	.....	.....	.....
Netherlands	842	437	.....	668	.....	.....
Poland	.....	.....	.....	2,178	.....	.....
Roumania (a)	(d) 5,269	7,791	8,690	11,194	12,321	.....
Russia-in-Europe (a)	42,109	.....	33,320	34,986	.....	.....
Sweden	972	1,564	1,568	.....	.....	.....
Switzerland	(d) 161	265	241	245	.....	.....
Czechoslovakia (a)	.....	.....	987	.....	.....	.....
North America—						
Canada	2,129	3,422	3,721	3,675	3,264	2,754
United States	51,482	48,866	39,025	37,452	36,327	37,209
Mexico	.....	.....	1,090	.....	.....	.....
South America—						
Argentina	43,225	45,767	45,995	46,134	(f) 30,672	.....
Brazil	10,550	.....	7,933	.....	.....	.....
Chili	4,567	4,500	.....	.....	.....	.....
Falkland	698	670	646	668	667	.....
Paraguay	600	600	.....	.....	.....	.....
Peru	.....	6,900	.....	11,056	.....	.....
Uruguay	26,286	11,473	.....	.....	.....	.....
Asia—						
India	22,934	22,865	22,011	22,075	22,085	.....
Philippines	104	168	196	.....	.....	.....
Russia-in-Asia	31,200	.....	14,370	10,499	.....	.....
Turkey-in-Asia	27,095	.....	.....	.....	.....	.....
Africa—						
Algeria	8,811	.....	9,140	.....	.....	.....
Egypt	816	858	930	986	942	.....
Kenya	.....	.....	2,528	2,741	2,464	.....
Madagascar	295	221	300	110	.....	.....
Morocco	3,175	5,080	6,710	6,723	6,319	.....
Tunis	729	2,662	2,183	2,038	2,820	.....
South Africa	35,808	28,492	26,289	31,730	.....	.....
Australasia—						
Australia	85,057	75,554	77,898	82,226	.....	.....
New Zealand	24,182	25,829	23,915	23,285	22,222	22,929

(a) The figures for 1913 are not comparable with those of later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908. (f) census.

SWINE

Thousands

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	25,659	11,518	14,178	15,818	14,683	.....
Austria (a)	(b) 6,431	1,107	1,326	.....	.....	.....
Belgium	1,412	770	977	976	1,139	.....
Bulgaria (a)	(b) 527	.....	1,118	.....	.....	.....
Denmark	1,468	716	1,116	1,430	1,899	2,853
Spain	2,710	4,434	.....	5,152	4,229	.....
Esthonia	.....	150	261	.....	272	.....
Jugoslavia (a)	(c) 866	.....	2,623	3,281	4,887	.....
Finland (a)	(b) 422	.....	374	375	.....	.....
France	7,036	4,389	4,942	5,166	5,196	.....
Great Britain	2,234	1,936	2,122	2,651	2,450	2,798
Greece (a)	(d) 227	.....	416	.....	.....	.....
Hungary (a)	(d) 7,580	.....	2,524	.....	.....	.....
Italy	(e) 2,508	2,239	.....	.....	.....	.....
Latvia	.....	.....	481	482	402	484
Lithuania	.....	.....	1,400	1,500	.....	.....
Luxemburg	137	89	.....	.....	89	.....
Norway	(b) 334	.....	127	.....	.....	.....
Netherlands	1,350	450	.....	1,519	.....	.....
Poland	.....	.....	.....	5,171	.....	.....
Roumania (a)	(d) 1,021	2,289	2,514	3,132	3,147	.....
Russia-in-Europe (a)	12,476	.....	11,063	11,951	.....	.....
Sweden	978	717	1,011	.....	.....	.....
Switzerland	(d) 570	465	546	640	.....	.....
Czechoslovakia	.....	.....	2,058	.....	.....	.....
North America—						
Canada	3,448	4,040	3,517	3,905	3,916	4,405
United States	61,178	74,584	59,344	56,097	57,834	63,424
Mexico	.....	.....	1,654	.....	.....	.....
South America—						
Argentina	2,901	3,199	3,237	3,221	1,437	.....
Brazil	18,401	.....	16,169	.....	.....	.....
Chili	184	292	.....	.....	.....	.....
Asia—						
Korea	761	963	1,078	.....	.....	.....
Formosa	1,322	1,313	1,303	1,281	.....	.....
Japan	310	470	528	499	.....	.....
Philippines	2,017	3,130	3,639	.....	.....	.....
Russia-in-Asia	1,756	.....	2,761	2,019	.....	.....
Siam	749	796	.....	750	864	.....
Africa—						
Algeria	112	.....	108	.....	.....	.....
Madagascar	600	221	.....	406	.....	.....
Morocco	16	128	132	115	78	.....
South Africa	1,082	724	560	915	.....	.....
Australasia—						
Australia	801	696	764	960	.....	.....
New Zealand	349	235	267	350	384	397

(a) The figures for 1913 are not comparable with those of the later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908.

In order to show the change in the position of the world's live stock since the war the following statement has been compiled comparing the total numbers of live stock by continents in 1922 with those of 1919. In the cases where, for certain countries, no estimates are available for 1922 or 1919 those for 1921 or 1920 are used in making up the totals. It must also be pointed out that included in the totals given in this statement are the figures for a few countries not mentioned in the above tables on account of the small numbers of their live stock. The figures for countries which have made only one official census or other estimate since 1919 have not been included.

In the case of the United States the figures for 1920 and 1923 have been used as the estimates in that country are made on the 1st of January and really represent the numbers of live stock in the previous year.

73638—7

Horses.—The countries included in the totals shown in the following table cover respectively 80 per cent for Europe, 50 per cent for South America, 25 per cent for Asia and practically the whole of the stock of horses for the remaining continents.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	31·7	30·7	+ 1·0	+ 3·0
North America	23·6	24·3	− 0·7	− 2·6
South America	9·4	9·3	+ 0·1	+ 1·5
Asia	4·1	4·0	+ 0·1	+ 2·1
Africa	1·4	1·3	+ 0·1	+10·6
Oceania	2·8	2·8	–	− 0·6
Totals	73·0	72·4	+ 0·6	+ 0·9

It appears from the above table that the variations occurring in the different continents more than balance each other and that in the aggregate an increase is shown. The decrease in North America which is almost entirely due to the figures for the United States with a diminution of 700,000 head is set off by the increases for all other continents. The countries in Europe which show marked development are in the first place Roumania, with an increase of 300,000 head, followed by France, Germany and European Russia, with increases of 200,000, 180,000 and 150,000 head respectively. The reductions in certain other European countries are quite unimportant. The increases in South America, Africa and Oceania are the result of comparatively slight additions in a large number of countries, the increase in Argentina of 150,000 head being alone worthy of special mention.

Cattle.—The countries included in the totals show about 80 per cent of the total head of cattle for Europe, 66 per cent for Asia, 33 per cent for South America and practically the whole for the other continents.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	94·4	90·4	+ 4·0	+ 4·4
North America	80·7	83·1	− 2·4	− 2·9
South America	28·2	27·8	+ 0·4	+ 1·5
Asia	126·5	127·1	− 0·6	− 0·5
Africa	28·4	25·7	+ 2·7	+10·3
Oceania	17·9	15·8	+ 2·1	+13·3
Totals	376·1	369·9	+ 6·2	+ 1·7

It will be seen from the figures that the reductions shown in the stocks of North America and Asia have been largely set off by the gains in other countries and especially in Europe.

In Europe the heavy losses suffered during the war have been almost made good and, although the complete totals are not available, it may be stated that the pre-war situation has been practically re-established. The most marked increases have taken place in Russia with 1,300,000 head, in Roumania with 900,000 head, in France with 800,000 head and to a less extent in numerous other countries. Very few European countries show any falling off in their total cattle stocks, though mention should be made of the reduction of about 450,000 head in Great Britain and Ireland.

After Europe, in order of importance as to actual increases, come Africa, Oceania and South America. In Africa the increase of 2,700,000 is chiefly distributed among the Union of South Africa, Southern Rhodesia, the Protectorate of South West Africa, Uganda, Nigeria, Madagascar and

French Morocco while in French Sudan and Tunis considerable reductions are recorded. Australia and New Zealand in Oceania and Argentina in South America were almost entirely responsible for the increases recorded in these two continents.

As regards North America and Asia the reductions in the first case will be found in the figures for the United States and Canada, though for Canada the change is quite inconsiderable, and in the second case in the figures for India.

Sheep.—The countries for which figures are included in the totals given in the following table cover the total stock of sheep for 75 per cent of Europe and South America, for 25 per cent of Asia, for 80 per cent of Africa and for practically the whole of North America and Oceania.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	119·3	110·9	+ 8·4	+ 7·6
North America	40·5	42·4	− 1·9	− 4·5
South America	57·9	53·4	+ 4·5	+ 8·5
Asia	23·4	24·1	− 0·7	− 2·7
Africa	48·7	47·8	+ 0·9	+ 1·9
Oceania	104·4	101·4	+ 3·0	+ 3·0
Totals	394·2	380·0	+14·2	+ 4·0

The greater part of the increase in head of sheep, as also in the case of cattle, is to be found in Europe, where an addition of nearly eight and a half million head has been recorded, which is however still insufficient to bring about the re-establishment of the pre-war position. Roumania and Jugoslavia are each responsible for an increase of over three million head, Russia for an increase of a million and a half and France for an increase of eight hundred thousand. The European increase would have been still more marked but for the reduction of about a million and a half in the stock of sheep in the United Kingdom. The additions in South America, amounting to four and a half million head, are almost all shown by Peru, though it should be observed that the figure for 1919 for this country is really an estimate based on the 1917 return. The increase in Oceania is due to the Australian figures, for which only those for 1921 are available; they make up for the falling off in New Zealand and show an aggregate increase of about three million head. In North America and the whole continent of Africa the changes are less marked and are caused by a decrease shown in the United States and an increase in French Morocco. Asia is the other continent in which the stock of sheep has shown a falling off, due almost entirely to the reduction of nearly eight hundred thousand head in India.

Swine.—The countries of the continents shown in the following table give for Europe about 80 per cent, for Africa 66 per cent and for North America and Oceania practically the whole of their stock in pigs. The figures for South America and Asia are however very incomplete and refer respectively to about 14 per cent and 7 per cent of the total stock.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	55·4	44·1	+11·3	+25·5
North America	67·3	62·3	+ 5·0	+ 8·0
South America	3·2	3·2	—	+ 0·7
Asia	3·7	3·5	+ 0·2	+ 5·4
Africa	1·3	1·3	—	− 1·5
Oceania	1·3	0·9	+ 0·4	+44·3
Totals	132·2	115·3	+16·9	+14·6

The figures shown in the above totals refer to about 60 per cent of the approximate world stock of pigs and it is necessary to treat the deductions suggested by the totals with reserve.

At the same time certain interesting variations may be noted for the continents for which relatively complete figures are available.

The total head of pigs shews a marked increase in Europe and while almost all the countries are concerned in this notable development the chief sources of increase are to be found in Germany with an addition of 3.1 million head, Holland and Denmark each with an addition of 1.1 million head, Russia, Roumania and France each with an addition of 800 to 900 thousand head. In North America there is a marked increase in the United States and a small decrease in Canada. In Africa the increase in Madagascar serves to set off a decrease in the Union of South Africa. The very considerable development shewn by the figures for Australia and New Zealand are the chief features in Oceania.

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

AT THE EXCHANGE OF THE DATES INDICATED

PRODUCTS, MARKETS AND DESCRIPTIONS	4 Jan. 1924	7 Dec. 1923	5 Jan. 1923	Aver. 1913
WHEAT.				
(cents per 60 lbs.)				
Canada:				
Winnipeg: No. 1 Manitoba	93	94	106	88
United States:				
Chicago: No. 2 Winter	105½	107	119¼	90¼
Minneapolis: No. 1 North	115	113	123	87⅝
New York: No. 2 Winter	124¼	121½	135	97¼
India:				
Karachi: Karachi white	103	104	122	91
Argentina:				
Buenos Aires: Barletta	100	110	122	100
Germany:				
Berlin: Home grown	–	–	112	128
Belgium:				
Antwerp: Home grown	–	115	121	104
France:				
Paris: Home grown	132	142	160	146
Great Britain:				
London: English	108	114	116	104
Liv. and Lond.: No. 1 Man	121	120	139	110
Liv. and Lond.: No. 2 Win	n.q.	n.q.	139	109
Liv. and Lond.: Pacific	123	126	154	111
Liv. and Lond.: Plate	118	119	140	108
Liv. and Lond.: Australian	122	127	153	117
Liv. and Lond.: C.W. Kar	n.q.	122	150	110
Italy:				
Milan: Home grown soft	112	108	154	148
Genoa: Mer Noire	127	128	–	116
Netherlands:				
Rotterdam: Home grown	n.q.	129	121	115
RYE. *(cents per 56 lbs.)*				
United States:				
Minneapolis: No. 2	67	65½	81½	56⅝
Germany:				
Berlin: Home grown	–	–	96	101
Belgium:				
Antwerp: Home grown	–	94	97	80
France:				
Paris: Home grown	95	102	118	97
Netherlands:				
Rotterdam: Home grown	n.q.	102	104	86

OCEAN RATES OF FREIGHT, AND VOYAGES	4 Jan. 1924	7 Dec. 1923	5 Jan. 1923	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE). *(cents per 100 lbs.)*				
Rumania:				
Danube to U. K.	15	17	17	11
Danube to Genoa	13	16	16	10
Russia:				
Azof. Black Sea to U. K.	13	13	–	11
Azof. Black Sea to Genoa	11	11	–	11
Canada:				
Canada to U. K.	15	16	18	14
United States:				
New York to Liverpool	12	14	10	10
North. Range to U. K. Cont	14	15	16	13
North Range to Genoa	17	18	22	20
North Pacific Ports to U. K.	38	37	38	43
Argentina:				
Plate Down River-U. K.	24	19	27	18
Plate Up River-U. K.	25	20	29	20
India:				
Karachi to U. K.	27	25	28	20
Rangoon to U. K.	30	29	34	29
Australia:				
Australia to U. K.	41	37	45	34
COTTON FREIGHTS. *(cents per 100 lbs.)*				
United States:				
New York to Liverpool	25	25	25	30
New Orl. to Liverpool	52	52	50	43

QUESTIONS TO BE SUBMITTED TO THE SEVENTH GENERAL ASSEMBLY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE, MAY 2, 1924

(a) Reports of the Permanent Committee

1. General report on the position and work of the Institute. M. Edoardo Pantano, Delegate of Italy, President of the Institute.

2. General Secretary's Report. Presented by M. Bolle, Delegate of Belgium, Chairman of the First Permanent Committee.

3. Report of the Chief of the Service of General Administration. Presented by M. Bolle.

4. Report on the financial position of the Institute. Reporter: M. Van Rijn, Delegate of the Netherlands.

5. Report on the method of payment of contributions by the adhering States. Reporter: M. Van Rijn.

6. Report of the Chief of the Bureau of General Statistics on the work of the Bureau. Presented by M. Asher Hobson, Delegate of the United States of America, Chairman of the Second Permanent Committee.

7. Report on the Statistics of Milk and Milk Products. Reporter: M. Fjelstad, Delegate of Norway.

8. Report of the Chief of the Bureau of Agricultural Intelligence and Plant Diseases on the work of the Bureau. Presented by M. Bilbao y Sevilla, Delegate of Spain, Chairman of the Third Permanent Committee.

9. Report on Farm Accountancy Bureaux. Reporter: M. Bilbao y Sevilla.

10. Report on the enquiry on Milk Control. Reporter: M. Fjelstad, Delegate of Norway.

11. Report on the production and consumption of Fertilizers. Reporter: M. Villegas, Delegate of Chili.

12. Report on Agricultural Meteorology. Reporter: M. Louis-Dop, Delegate of France, Vice-President of the Institute.

13. Proposal of the Permanent Committee, requesting the General Assembly, in accordance with the wishes expressed by the International Labour Bureau, to authorize the conduct of an enquiry into the Prevention of Anthrax among Cattle. Reporter: M. Rovira, Delegate of Uruguay.

14. Report of the Chief of the Bureau of Economic and Social Intelligence on the work of the Bureau. Presented by M. Leao, Delegate of Portugal, Chairman of the Fourth Permanent Committee.

(b) Proposals by the British Government

1. That in view of the provisions of Article 9 (*b*) of the Convention of June 7th, 1905, the Institute should be regarded as the seat and centre of all voluntary international action for the development of agriculture.

2. That international organizations concerned with agriculture or desirous of obtaining the support of agriculturists should be invited to place themselves in communication with the Institute with a view to secure the co-ordination of the arrangements to be made with regard to:—

(*a*) the dates and places of their meetings.
(*b*) the publication of their resolutions, procès-verbaux and reports.
(*c*) the constitution of their permanent bureaux, if any, and
(*d*) any other matters likely to be of interest to agriculturists generally.

3. That the adhering Governments be invited to take the foregoing resolutions into their consideration and to adopt such measures as they may think desirable in order to give effect to them.

(c) Questions submitted by the Government of the United States of America

The Government of the United States of America is of opinion:

1. That the Institute be authorized to encourage the several governments to conduct comparable national inquiries concerning agricultural economic conditions throughout their respective areas.

2. That the General Assembly consider the adoption of a programme of work for the future development of the Bureau of Economic and Social Intelligence with a view to promoting, when finances permit, increased attention to the study of farm management, land economics, and the marketing of agricultural products.

3. In view of the limited income of the Institute, it is desirable that its efforts be confined to those activities which it is specially competent to perform by reason of its international position created by the treaty of 1905, and that care be exercised

that it does not undertake projects which may be performed as efficiently and inexpensively by the adhering governments acting separately.

4. That consideration be given to the admittance of agricultural and other associations as associate members of the Institute.

5. The United States commends the Institute for its efforts in developing the statistical service and recommends further extension in the use of the telegraph.

6. The United States recommends that American equivalents of weights and measures be used in the publications of the Institute that are to be distributed in the United States and Canada.

7. That the name of the bureau now entitled "Bureau of Agricultural Intelligence and Plant Diseases" be changed to "Bureau of Agricultural Intelligence and Plant Protection."

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DEPARTMENT OF AGRICULTURE
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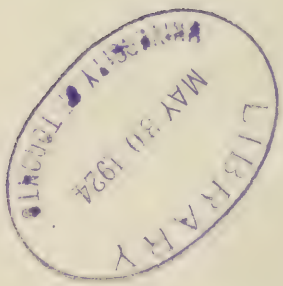

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

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